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GLOBAL POWER POLITICS

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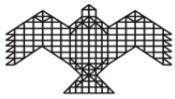
Polar and ocean research plays a key in developing a knowledge database on the unknown horizons in the earth's system. We currently witness vast changes in ocean temperatures, glacier shrinking, and ice sheets in the polar regions, which could have a critical impact on the seas, life in the ocean and land. Understanding the nature of the polar regions and oceans is essential through a multidisciplinary approach.

NIAS Polar and Ocean Studies aims to study the polar regions - the Arctic and Antarctic. On the Oceans, it aims to study the following verticals: Governance, Conservation, Blue Economy, Security, Infrastructure, Ocean Health, Ocean Science, Ocean as a Global Common and Maritime Security

Indo-Arctic Reader will focus on capacity building amongst young scholars, expert lectures by prominent academicians and diplomats, monthly discussions on Arctic and a Monthly Dispatch – *Indo Arctic Reader*.



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The National Institute of Advanced Studies (NIAS) was conceived and founded in 1988 by the late Mr JRD Tata, who sought to create an institution to conduct advanced multidisciplinary research.
The objective is to nurture a broad base of scholars, managers and leaders who would respond to the complex challenges that face contemporary India and global society, with insight, sensitivity, confidence and dedication.

About Indo-Arctic Reader

Indo-Arctic Reader is an academic initiative started by NIAS Global Politics under the Science, Technology and International Relations Programme.

The Monthly is an integral part of NIAS Polar and Ocean research. It includes focused commentaries on the Arctic and the Antarctic and daily updates on contemporary Polar. The opinions expressed in this publication are those of the authors. They do not purport to reflect the opinions or views of any institutions or organisations.

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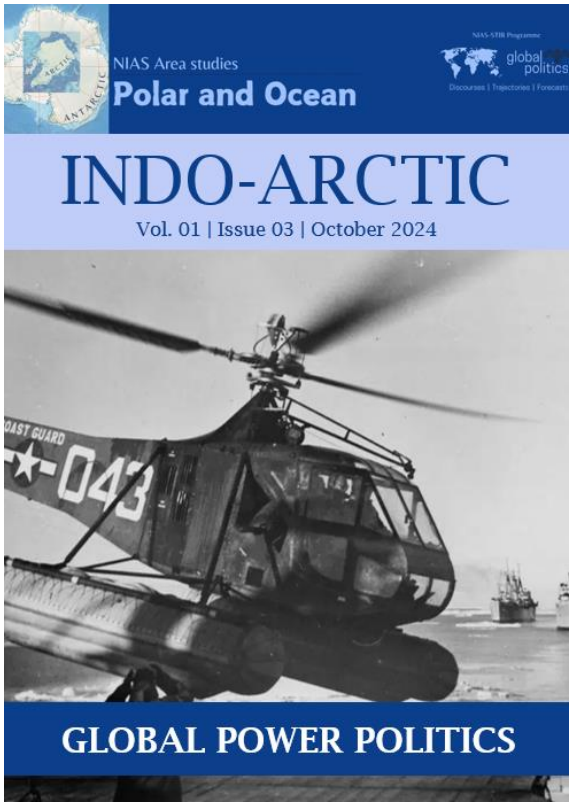

US Coast Guard expedition in the south pole Image Source: Wikimedia

IA COMMENTS

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IA DAILY BRIEF

By Sayeka Ghosh, Advik S Mohan and Padmashree Anandhan

Source: KSAT, Liu Shipping, polarbearsinternational, Niels Fuchs, University of Hamburg, Murmansk Telegram, Down to Earth

IA Daily Brief provides a brief overview of the latest developments in the Arctic and Antarctic from climate change, economy, politics, science and technology, security and governance aspects.

COMMENT

Geoeconomic Significance of the Arctic

Padmashree Anandhan, *Research Associate, NIAS*

Introduction: How did the idea of geoeconomics evolve?

The geopolitical aspect means the territories and boundaries, characterising the space combined with politics whereas geoeconomics represents the softer diplomacy keeping economic security as the spearhead interlinked to geopolitics. Similar to the terms, the concepts remain interlinked and most often supersede one another with changing global security dynamics. [Vesa Väätänen and Kaj Zimmerbauer, 2021, 1] Understanding the Arctic and Antarctic from a geoeconomic perspective is important to trace the political and economic consequences. The first step would be to give a short overview of the theory of geoeconomics and next to see how it articulates with the latest Arctic and Antarctic strategies and policies of Russia, India and Saudi Arabia.

The idea of geoeconomics sparked in 1990 under Edward Luttwak, who wrote about the shift between geopolitics and geoeconomics where the tool of commerce overrode hard power in an "interstate conflict." Post this, the concept became well-known during the post-Cold War period giving rise to major "economic powers" such as China and India. [Vesa Väätänen and Kaj Zimmerbauer, 2021, 3] When comparing international relations and geoeconomics theory, the latter has always been used to look at the geopolitical repercussions rather than using it as an exclusive tool to develop "economic strategies." [Sparke. M, 2018, 484-489] In the last three decades, the perception of geoeconomics has altered. In 2024, Matthew Sparke defines it as "economic statecraft" involving policies and practices. The World Economic Forum calls it an "application of power politics by economic means" [WEF, 2024] where the aim remains to fulfil the state's security goals. From these conceptions, one can understand how geopolitics and geoeconomics are interlinked yet applied differently to security dynamics. Two examples from the current global politics could be the US-China economic tussle and Ukraine-Russia geopolitical war. From these instances, the application and power of geoeconomics can be viewed as a trade or sanction tool to reach the economic goals of a state. This can also be reversed to achieve a security goal. Therefore, looking at geoeconomics as a means to an end and an end to a means will help to construe the polar strategies of Russia, India, and Saudi Arabia to trace the way forward.

What is the geoeconomic significance of Polar?

The Arctic and the Antarctic remain the most unexplored regions with no answers to what lies beneath the ice sheets. Recently it has gained attention due to thawing permafrost and environmental changes which has increased its geopolitical significance and there are now more avenues for geoeconomic explorations. This applies especially to extracting more natural resources and discovering new shipping routes. It also attracts states which are not geographically connected such as China which has excelled in Polar scientific research and in building icebreakers. Brazil is also another example. Remotely located from the Arctic, it published a ten-year plan listing its agenda (Identifying resources and new shipping lanes) in the Antarctic and Arctic recognising the climate change threat and the impact on its tropical climate. Geopolitical tensions, geoeconomic competition and impact on climate change come into play when more actors grow interest. To see which triggers what, the geoeconomic competition and motive to have access to more resources in the polar makes it the underlying cause for

geopolitical game.

Arctic geoeconomics

According to the World Ocean Review, the term Arctic is referred to as "The physiographic region defined by the tree line on land and by the convergence zone in the seas." [World Ocean Review, Anon, 2019] The Arctic is in the high north encircling six per cent of the earth's surface with an extreme climate and scarce population permanently residing. Compared to the Antarctic, it consists of more ocean than land with frozen water, ice, glaciers and permafrost. The resources in the disputed waters are estimated to be 22 per cent of untouched fossil fuels, 90 billion barrels of oil and 1670 trillion cubic feet of natural gas. The ice sheets of Greenland and Antarctica hold the key to 99 per cent of ice on the earth and scientists warn that melting of even two such covers would result in a global sea level rise by 70 metres and flooding of longest coastlines. [World Ocean Review, Anon, 2019] The geo-economic landscape of the Arctic would be everchanging due to climate change where boundaries will no longer matter. More melting occurs, the Arctic Ocean will become more fluid more actors such as the Middle East can become eligible to extract resources. Currently among Russia, Canada and Norway, the former two have already conducted extractions of oil and hydrocarbons. Along with them, the US also found oil fields. According to a study report published by the US Geological Survey (USGS) in 2008, close to 10 mineral sources were traced in the Arctic in 33 sites. Some include copper, gold, uranium, iron, and zinc. It also contained fossils, marine species and fisheries (cod, pollock, and salmon).

Since the 20th century, the Arctic was warned to be warming double and continuing decline in sea ice. This was confirmed in the Intergovernmental Panel on Climate Change (IPCC) 2019 report. Such weather events have given scope for competition for raw materials and the development of shipping routes such as the Northern Sea Route (NSR) and the possibility of a Northwest Passage (NWP). The Arctic states include Canada, Denmark, Finland, Iceland, Norway, Sweden, the Russian Federation, and the US. However, the changing climate conditions and warming of the Arctic are observed to be aiding Russia's geopolitical goals. During World War I, the region was highly militarised and since World War II and the Cold War, the geoeconomic way of power projection and environmental factors began to be recognised. Non-Arctic States such as Singapore, South Korea and Japan have begun to invest. Ministry of Foreign Affairs Singapore in 2023 highlighted its aim to seize opportunities in climate patterns and economic developments. It showcased its capacity to build icebreakers to contribute to the Arctic's infrastructure. It can be a driver of economic engagement becoming a point of reliable shipping route for North Asian ports. The Malacca Straits were viewed as a chokepoint of piracy and political chaos directing supplies through the Arctic can be economically easy. In the case of South Korea, was the first to release an Arctic policy in Asia in 2013 to form partnerships. One of its assets is to contribute to Arctic technologies and to build icebreakers through marine engineering and shipbuilding. Whereas Japan's policies aimed to boost research and development in the Arctic shipping and joint research. The strong presence of the geopolitical actors cannot be ignored. The US sees the Arctic as "America's Fourth Coast" and released the strategy in October 2022. It aims to advance maritime security in preparedness for strategic competition in the Arctic. Whereas, China called itself a "near-Arctic" state in 2018 investing close to USD 90 billion till now in energy and resources projects and has become the second largest trade partner of Russia. China's COSCO ship company was observed the most operated in the Northern Sea Route (NSR) since 2013. Since the popularity of geoeconomics has risen in the last two decades projecting power through economic means is important to achieve strategic objectives. For that, access to natural resources and control of shipping lanes is needed. To secure both, the militarisation and interventions of other actors occur.

COMMENT

The Cold War Era and the Arctic

By Advik S Mohan, Research Intern, NIAS

History of expeditions

The Arctic region has been coveted as an area to explore since the Vikings in the 10th century. The polar regions were always considered as a subject of fascination and with scope for further exploration. However, proper explorations with scientific purposes began in the region only in the late 19th century. In 1893, Fridtjof Nansen, a Norwegian explorer launched an expedition on the ship Fram to reach the North Pole. While the expedition failed to reach the North Pole, it showed that the northern polar region was an ice-covered sea rather than an established landmass. In the late 19th and early 20th centuries, Robert Peary, an American explorer launched eight different expeditions to the North Pole. While several explorers like Frederick Cook and Robert Peary claimed to have reached the North Pole, the first one to have reached it is believed to have been Roald Amundsen. Amundsen, a Norwegian explorer flew over the North Pole in 1926. Between 1928 and 1930, a prominent expedition to Antarctica was led by Richard E. Byrd, an American naval aviator. Byrd established a reputation for himself as a prominent explorer over the polar regions. He became the first person to fly over the South Pole. Additionally, Byrd established the first permanent American research base in the polar regions. In 1936, Paul Emile-Victor, a French explorer crossed the entire Greenland ice sheet from west to east. In 1947, the French Council of Ministers began planning French expeditions to the Arctic and Antarctic, with Emile-Victor in charge of the planning.

The Cold War era

The Union of Soviet Socialist Republics (USSR) treated the Arctic as a region to be developed for the purposes of economic progress. Yuri Slezkine, a historian stated that Josef Stalin, the leader of the USSR regarded no plan as too far-fetched or climate as too extreme for economic progress. According to John McCannon, a historian; the northern parts of the USSR were considered to be a tabula rasa or blank slate for the Soviet state to project its hopes, dreams, and thoughts about progress. The push towards bringing economic development to the regions became a matter of national pride for the USSR. After Germany invaded the USSR during World War II, the polar regions acquired newfound importance as a route for transporting goods and a source for important minerals like lumber, coal and iron. Amidst the Cold War with the US, the significance of the Arctic increased. The Northern Sea route from the Arctic Sea regions to the north of Norway all the way until the far eastern parts of the USSR bordering Alaska became increasingly important as a key shipping route. On 23 April 1948, Alexander Kuznetsov, a scientist led an expedition of Soviet scientists flying Lisunov Li-2 planes to the North Pole. Kuznetsov and his team became the first explorers to have confirmed proof of having landed in the North Pole. In September 1952, the Government of the Soviet Union issued a national decree stating that all the nearby seas (the Kara, West Siberian, East Siberian, Laptev, and Okhotsk Seas) were Soviet territory. Soviet forces were ordered to seize all neighbouring foreign ships as well. The decree of 1952 had no basis in international law and escalated fears amongst the US and its allies in the North Alliance Treaty Organization (NATO).

Militarisation of the Arctic

The Soviets began using the Arctic region for military purposes, deploying bombers in the region, and plotting attack routes through the Arctic. The development of Inter Continental Ballistic Missiles (ICBMs) by the USSR meant there was a threat cities in the US could be attacked by a nuclear warhead. Additionally, the Arctic Ocean

became a potential route for Soviet submarines and bombers. In response, Ballistic Missile Early Warning Systems (BMEWS) were developed and deployed in the US state of Alaska and the Danish territory of Greenland. Additionally, the US Government expanded surveillance efforts in the polar regions. On 3 August 1958, the USS Nautilus operated by the US Navy and the first-ever operational nuclear-powered submarine became the first submarine to complete a transit of the North Pole. Dwight D. Eisenhower, the President of the United States at the time had ordered the transit of the USS Nautilus as a response to Soviet expansionism. The US had been planning the usage of the polar regions as a potential site of deterrence against Soviet attacks since the aftermath of World War II, when tensions between the US and USSR began to grow. In 1946, the Strategic Air Command (SAC) was started by the US Armed Forces (USAF), with the purpose of deploying bombers along the northern Arctic regions such as northern Canada, Greenland and Alaska. The USAF also built military bases across the northern Arctic region, including the Thule Air Force Base in Greenland. On 2 December 1946, Richard E. Byrd, the naval expeditor who was a Rear Admiral in the US Navy now began an expedition to Antarctica, commissioned by the US Government to establish an American presence in Antarctica. The expedition known as Operation Highjump succeeded in documenting the geography of the region, providing details related to medicine, equipment, and survival techniques which would help the Navy in future endeavours to the region. In 1955, the International Geophysical Year (IGY) conference was organized. The IGY helped ensure collaboration between the military and civilian scientists at an international level for the purposes of polar research and expansion. Owing to the danger of the Cold War spreading to the polar regions, President Eisenhower used the IGY as a platform to negotiate the usage of Antarctica for peace and research purposes only. On 01 December 1959, after negotiations; the Antarctic Treaty was signed between 12 nations involved in Antarctic research, including the US and USSR. The provisions of the Treaty included an agreement that the continent would be utilized only for peaceful purposes and no military activities. The Treaty also stated that scientific observations would be freely exchanged, and all sides needed to cooperate. Another provision was that claims to territorial sovereignty within Antarctica would not be allowed.

End of Cold War & START I

In the late 1970s, with the development of long-range cruise missiles, the Arctic became a potential superpower battleground. Later, nuclear-powered attack submarines that could use the Arctic's icy water to avoid detection became crucial, with both the US and the USSR prioritizing the development of these submarines. The US Navy adopted a maritime strategy wherein Soviet military bases in the Arctic would be attacked in case of a war in Europe; in order to open a two-front war. The Soviets responded with a bastion strategy wherein their submarines were kept hidden within small areas, covered with airplanes and surface ships. This helped ensure the submarines stayed out of American sight. However, the fall of the USSR and the end of the Cold War reduced the strategic importance of the Arctic. A crucial treaty signed in the 1990s was the Strategic Arms Reduction Treaty I (START I) which reduced the number of strategic and tactical nuclear weapons. Another treaty was the Arctic Military Environmental Cooperation (AMEC) agreement wherein nuclear submarines from the Soviet era were decommissioned. The geopolitical competition in the Arctic was halted briefly, due to these overtures.

COMMENT

Arctic Expeditions: Post Cold War

By Shreya Jagadeesan, St. Josephs University, Bangalore

A crucial geopolitical nexus that helped to bridge the ideological gap between the US and the USSR after the Cold War was the Arctic region. NATO created a strong defensive posture in the Arctic, setting up military installations and monitoring networks to prevent Soviet aggression and protect Western interests. Concerns about possible Soviet submarine and bomber routes through the GIUK Gap added to this strategic focus. Scientific collaboration developed on subjects like environmental conservation and ecological degradation, despite the militaristic emphasis. Collaboration increased after the fall of the Soviet Union, as seen by the US-Russia Long-Term Census of the Arctic accord (RUSALCA). The Arctic's unique location at the crossroads of geopolitics, sustainability, and international relations is highlighted by the complicated dynamic that has resulted in the escalation of tensions between Russia and the West, which might potentially undermine these cooperative efforts. [i]

Arctic Superpowers: Agenda and Objectives

To engage with the Arctic, the United States, Russia, China, and the European Union/NATO have all evolved unique policies that are indicative of their own geopolitical goals and economic objectives. Priorities for improving operational awareness, sustaining military presence, and encouraging cooperation with allies are outlined in the U.S. National Strategy for the Arctic Region. In an effort to strengthen its claims to sovereignty, Russia has increased economic activity and conducted extensive military drills.[ii]

China has been aggressively seeking access to new shipping routes and natural resources, increasing its presence in scientific research, and forming strategic alliances, while not being a member of the Arctic Council.[iii] Geopolitical concerns have led to an increase in interest from the EU and NATO in addressing possible security difficulties while strengthening collaboration on areas such as climate change and sustainable development. Along with other Arctic countries, Canada places a high priority on preserving indigenous rights and cultural legacy while striking a balance between environmental preservation and economic growth. The intricate geopolitical terrain emphasises the necessity of cautious diplomacy and collaboration among Arctic states to effectively manage common resources and avert possible confrontations. Some analysts have referred to the current period in the Arctic as a "new Cold War" due to the ongoing rivalry between China and Russia and the West, as well as the region's unique position at the nexus of geopolitics, environmental stewardship, and international relations. [iv]

Geopolitics and Regional Power Dynamics

The Arctic Council functions as the principal forum for regional affairs, promoting cooperation on a range of issues; however, beneath this apparent cooperation is a complex web of interests and power struggles. At the regional level, Arctic states have demonstrated a preference for retaining dominance in the region, as evidenced by their adherence to the Law of the Sea and issue-specific agreements under the framework of the Arctic Council, these arrangements primarily benefit the Northern countries while guaranteeing that Arctic issues are managed by the Arctic states themselves. Russia's military modernisation and infrastructure development in the Arctic highlight its intention to re-establish military power in the region, a strategic focus arising from Russia's dominant position in the North,

notably through its Northern Fleet, which is based on the Kola Peninsula.[v]

Diplomatic Expeditions

In the Arctic after the Cold War, diplomatic missions were essential in promoting international collaboration. These trips provided forums for mending long-standing tensions between erstwhile rivals and fostering international cooperation. Since its founding in 1996, the Arctic Council which unites six organizations representing Indigenous peoples and eight nations with Arctic territory has grown to be a crucial hub for collaboration. The council showed tenacity in the face of global difficulties by resolving conflicts on the Iraq War and Russia's annexation of Crimea. Joint scientific missions, like those studying climate change, allowed countries to work together while preserving diplomatic ties. In addition, informal, non-governmental exchanges between scientists from other nations promoted collaboration and helped preserve ties. But after Russia invaded Ukraine in 2022, things became more tense, which resulted in a suspension of Arctic Council operations and a worsening of relations between Russia and Western countries. This change emphasises the intricate dynamics of Arctic diplomacy, where geopolitical tensions and scientific cooperation frequently coexist.[i]

Challenges

During the post-Cold War era, the Arctic region encountered numerous difficulties that still influence its geopolitical environment today. The Arctic area experienced a shift in priorities from military conflict to enhanced collaboration on matters like resource management and environmental conservation. However, due to causes like climate change and the emergence of new global powers, great power struggle in the Arctic resumed in the post-Cold War era. This change has resulted in heightened hostilities between major nations, especially between Russia and the West, in a "new Cold War" in the Arctic. The management of shared resources and the possibility of conflict over these resources has been one of the main issues in the Arctic. Huge oil, gas, mineral, and fishery reserves have been made visible by the melting of the Arctic ice covers, drawing interest from powerful nations and igniting a struggle for dominance in the area. There are unique difficulties associated with China's Arctic involvement. China has referred to its involvement in the Arctic as the "Polar Silk Road," despite not having a physical border there, suggesting its intention to explore trade routes and obtain natural resources.

The Arctic region and its countries faced serious challenges as a result of climate change in the post-Cold War era. The Arctic ice melted at a rate never seen before due to the quickening pace of global warming, expanding accessibility to the area and rekindling interest from around the world. Climate change's greater accessibility, along with technology developments in marine exploration, caused a boom in formerly inaccessible Arctic waters' commercial activity, including shipping, fishing, and oil exploration. Consequently, Arctic countries were under increasing pressure to strike a compromise between economic growth and environmental preservation, which resulted in increased military spending and regional strategic planning. Concerns regarding territorial claims, national security, and possible resource conflicts were also sparked by the melting ice cap.

Additionally, indigenous populations in the Arctic faced threats to their traditional ways of life and environments, making them particularly vulnerable to the effects of climate change. The swift velocity of these alterations surpassed scientific estimations, posing difficulties for administrations to predict and amicably settle global conflicts in the area. The Arctic's geopolitical landscape saw a substantial transition in the post-Cold War era due to the pressing need to address the environmental effects of climate change as well as the emergence of new economic and strategic interests in the region's fast changing environment.[vi]

In conclusion, the Arctic region had a significant metamorphosis in the years following the end of the Cold War, changing from a centre of military conflict to a

complicated battlefield of global cooperation and rivalry. Several significant developments signalled this shift: First off, as seen by the Soviet Union's exit and the dismantling of NATO's Arctic defences, the end of the Cold War resulted in a major decrease in the military presence in the Arctic. This reduction in overt military conflict, however, concealed a new phase of geopolitical rivalry as powerful nations looked to forge strategic alliances and economic gains in the area. Second, the Arctic Council has become an important platform for regional international collaboration, promoting discussion on topics ranging from resource management to environmental preservation. This multilateral strategy signalled a desire for collaborative administration of the Arctic and marked a break from the bipolar Cold War era organisation.

Thirdly, the Arctic's previously unexplored oil and gas reserves have brought fresh economic vitality to the area. Major powers became interested in this breakthrough, which sparked a race for influence and control over these resources. Some commentators have labelled the competition that has resulted for Arctic assets as a "new Cold War" in the region. Fourth, the physical terrain of the Arctic has undergone significant alteration due to climate change, making formerly uninhabitable areas available to human activities. As countries struggle to strike a balance between environmental preservation and economic development in the face of fast change, this upheaval has brought both opportunities and challenges.

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IA DAILY BRIEF [1]

By Advik S Mohan, Sayeka Ghosh, and Padmashree Anandhan

BIODIVERSITY

Polar light dynamics and a new theory on biodiversity preservation

On 23 September, a study by researchers from Finland propose that the unique light environment in Earth's polar regions fosters biodiversity through circumpolar hybrid zones. The team led by Professor Kari Saikkonen advanced this theory in a recent journal, One Earth, hypothesising that extreme polar light conditions compress species' reproductive windows, thereby increasing opportunities for hybridisation. Unlike temperature, light patterns remain constant across various latitudes, hence impacts the reproductive timing among the organisms. That synchronisation between closely related species enhances hybridisation in the polar regions. Saikkonen said: "At the center of our theory is the hypothesis that the extreme light environment of the polar regions creates hybrid zones in both polar regions." This study underscores the role of microbes in biodiversity development and maintenance. Climate change is alarming because it has a fundamental impact, especially in polar regions. Polar warming is already occurring at two to four times greater than the average rate of Earth temperature change. Besides, diversity can recover in the long term following disturbance, but restructuring of the ecosystem will be evidenced. Saikkonen stressed the importance of genetic diversity and species interactions and said: "We propose that biodiversity can, in the long term, recover after disturbances and mass extinctions, but ecosystems will restructure as novel species assemblages." This theory challenges conventional biodiversity discussions by highlighting genetic diversity and microbial associations. ("Extreme polar light environment of the North and South Poles sustains biodiversity, researchers suggest," *Phys Org*, 23 September 2024)

Ukrainian polar explorers welcome "SeaBaby" to Antarctic wildlife family

On 26 September, *Ukrainska Pravda* reported that in a heartwarming display of scientific engagement, Ukrainian polar explorers at the Vernadskyi Research Base on Winter Island have named the first Weddell seal pup of the season "SeaBaby". A Ukrainian-made uncrewed surface vessel inspired the given name, one among almost 400 entries. Biologist Svitozar Davydenko, who was the first to locate the pup, lent his name to it as its patronymic. At 10 days of age, SeaBaby is growing up and in a week she will venture out to discover the sea by herself. It is going to be after seven weeks of staying inside her mother's belly. The adventurous explorers jokingly said: "Soon the SeaBabies will not only be in the Black Sea but also in the Southern Ocean." This naming event again demonstrates the vibrancy of wild activity around the research station since four more pregnant seals are going to give birth to their pups shortly. The enthusiasm of the explorers engaging with public interest is again embraced by their declaration on future competitions and a prize draw. ("Ukrainian Antarctic researchers select name for first seal born this year – photos," *Ukrainska Pravda*, 26 September 2024)

International Bear Association Conference with bear insights, says an interview in *Polar Bears International*

On 25 September, an interview in the *Polar Bears International* stated that the 28th annual International Bear Association conference in Edmonton, Alberta, brought

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together scientists and managers from around the globe. The interview with Geoff York and Alysa McCall contributed by sharing their personal experience, showing how the event had evolved into social science and traditional knowledge. The conference started with a most informative and groundbreaking session on indigenous knowledge, reflecting the cultural traditions often viewing bears as closely related to human beings. Polar bear research alone stood out among the discussions of terrestrial bears, calling attention to its unique marine habitat and consequent conservation challenges. Alysa said: "Polar bears really are so unique in the bear world. They're the marine bear, they're the ocean bear." The conference showed advanced research methods, such as using artificial vanilla to attract Andean bears into a study about facial recognition. It also caught attention to contributions by Polar Bears International, including messaging related to climate change and technologies for tracking like "burr on fur" tags. Geoff York emphasised the opportunity to learn from other species' conservation challenges and said: "We have this unique opportunity to avoid some of these issues, or to manage how we get there as populations shrink in abundance and retract in range." (Kieran Mulvaney, "From Traditional Knowledge to Vanilla Sticks," *Polar Bears International*, 25 September 2024)

Norwegian deep-sea mining poses risk to Arctic biodiversity

On 24 September, an article in *The Hans India* informed plans by the Government of Norway to go ahead with deep-sea mining could cause irreparable damage to the unique ecosystems of the region. A report titled Deep Sea Mining in the Arctic: Living Treasures at Risk by environmental organization Greenpeace brought out the risk of lasting environmental damage through the actions of the Norwegian government. In January 2024, the Norwegian Parliament voted to explore its Arctic seabed for minerals. In June 2024, the Norwegian Ministry of Energy released plans for the first round of licences. Norway aims to extend its licences and begin mining by 2030. Haldis Tjeldflaat Helle, a campaigner for Greenpeace Nordic stated Norway was contradicting its official environmental positions through its support for deep-sea mining companies. Mads Christensen, the Executive Director for Greenpeace International stated the decision of the Norwegian government to open up 281,000 square kilometres in an extended continental shelf for deep-sea mining was putting ocean life and the livelihoods of those who depend on it at risk. Christensen also informed the manganese crusts around hydrothermal vents which the Norwegian government was hoping to mine for metals were unique habitats with endemic species found nowhere else on the planet. Mining would also disrupt ecosystems containing deep-sea species that grow slowly and mature late like sponges, sea pens, lace corals, and black corals. Additionally, deep-sea mining effects such as noise and light pollution, sediment plumes, and the release of toxins could impact both marine and human communities. This is because unique conditions in the Arctic Ocean create a spring phytoplankton bloom which feeds important fisheries like herring and mackerel. The living ecosystems of whales and dolphins will also be significantly impacted through an increase in deep-sea mining. Norway's plans come amidst an increase in ocean temperatures and water acidification, with the burning of fossil fuels an added factor. The Greenpeace report stated the Norwegian government needed to facilitate more scientific research in its environments and work with other countries towards the preservation of marine environments. The organization called on Norway to abandon its deep-sea mining plans and instead add its name to a list of countries supporting a moratorium on the practice of deep-sea mining. (Olivia Rosane, "'Irreversible Harm': Norwegian deep-sea mining threatens Arctic biodiversity," *The Hans India*, 24 September 2024)

India witnesses rare bird returning

On 06 September, an article in *Hindustan Times* informed the Arctic Tern bird had been spotted in India after 96 years. The bird species migrates from the Arctic Circle to Antarctica, and vice versa every year. It has been spotted in Mumbai this year, despite India being nowhere on its original flight route. Mohit Mehta, an architect and birder stated the Arctic Tern ranks 1,330 out of 1,363 bird species in India in terms of rarity according to birder Subhadeep Ghosh. The bird sighting has led to a surge in excitement amongst the birder community. Connected through online groups, birders have been venturing to spot the bird in Mumbai Reports by birders indicate the Arctic Tern has been reportedly spotted over 90 times in the past week. Akshay Shinde, a naturalist stated the Indian Ocean storm might have blown the birds away towards the Indian coast. According to Shinde, the birds might be waiting in India to regain their energy for take-off, or for more birds to join them. The White-Cheeked Tern, another rare bird has been reportedly spotted 33 times. According to Mehta the increase in birder sporting in Mumbai this year could be a reason behind the increase in Arctic Tern spottings increasing. Mehta informed that while birding in the monsoon season was generally low due to fears of equipment being ruined, more individuals had ventured out this monsoon. According to Mehta, this was due to reports of pelagic birds being spotted on the Mumbai coast. Mehta also stated the Arctic Tern might have visited India more often than noticed. (Sabah Virani, "Mumbai birders go wild after Arctic Tern spotted in India after 96 years," *Hindustan Times*, 06 September 2024)

New Arctic dragonfish species revealed

On 04 September, an article in *W&M News* informed about a new species of Arctic dragonfish named Akarotaxis Gouldae or Banded Dragonfish being discovered near the western Antarctic peninsula. The species was discovered by researchers at VIMS and William & Mary's Batten School of Coastal & Marine Sciences. Genetic analysis was used to identify the species initially. While the larval specimens collected were assumed to be from the closely related species of Akarotaxis nudiceps initially, later DNA comparisons found variations in mitochondrial gene regions. This indicated that the larval specimens formed part of a species themselves. Andrew Corso was the lead author conducting the research. Corso and his colleagues compared samples of Akarotaxis nudiceps with adult Akarotaxis gouldae from around the world. The team found morphological differences between the two samples. Their genetic testing also revealed estimates that the Akarotaxis gouldae had emerged as a separate species about 780,000 years ago. According to Corso, it is hypothesized that a dragonfish population might have become isolated under glaciers, surviving on food pushed in by ice. Corso also stated that this subpopulation became distinct enough to be reproductively incompatible with Akarotaxis nudiceps. Antarctic dragonfishes spend most of their life under the deep water of the remote Southern Ocean; meaning that there is limited knowledge about them even now. However, research indicates that they have limited reproductive capacities. While Akarotaxis nudiceps are distributed in waters surrounding Antarctica, larval sampling data suggests that the Akarotaxis gouldae is distributed in the waters around the western Antarctic peninsula. Corso stated that the gouldae appear to be a vulnerable species, owing to their limited range, little reproductive capacity and presence of early life stages in shallower waters. According to Corso, caution needs to be exercised when exercising resources from the Antarctic area. He informed that this approach needs to be followed until the ecosystem impacts are better understood. ("New species of Antarctic dragonfish highlights its threatened ecosystem," *W&M News*, 04 September 2024)

Arctic algae survive under minimal light

On 04 September, an article in *Interesting Engineering* informed that an international

research team study had shown that Arctic microalgae could produce biomass even under minimal light. The MOSAiC research expedition studied microalgae under the icy and limited light conditions of the Arctic Ocean and found that the biomass could be built up by the end of March. This research showcased that algae could convert sunlight into energy or perform photosynthesis under conditions believed to be too dark; meaning that microalgae can thrive with light levels close to the theoretical minimum. The main areas of focus for the research team were phytoplankton and ice algae, with the measurements showing that microalgae began to build up biomass just days after the polar night ended. The extremely sensitive light sensors placed in the ice and water by the team showed that even one-hundredth of the usually available light was enough to make the microalgae grow. Clara Hoppe, head of the research team stated that it could be assumed that organisms in other regions of the ocean have adapted well to the lack of light if the algae in the Arctic Ocean could do so. According to the study, it might be possible for photosynthesis to occur in deeper ocean regions with minimal light and provide oxygen and energy for marine life. (Sujita Sinha, "Photosynthesis miracle: Arctic algae thrive with just 100,000th of daylights," *Interesting Engineering*, 04 September 2024)

Five UK seabird species added to red list, reports *The Guardian*

On 02 September, *The Guardian* reported that five species of seabird, including Arctic tern and great skua, have joined the UK's conservation red list. This is due to their decline in populations, raising fears of local extinction. According to the study published in British Birds, threats to the seabirds are increasing from climate change, overfishing of key food sources like sand eels, and invasive predators like rodents. Another reason has been bird flu. It means that the RSPB, along with other conservationists, urges the government to extend marine protected areas, bring in better fisheries management, and reduce bycatch in fishing gear to give these vulnerable birds a fighting chance. The UK and its immediate waters are crucial for seabirds globally. Most of the world's breeding Manx shearwater, northern gannet, and great skua depend on it. The RSPB's global conservation director Katie-jo Luxton said: "Urgent action is needed now to reverse the declines and support recovery." The red list now comprises 73 of the UK's 245 regularly occurring bird species, an alarming reflection of the state of the nation's birdlife. (Helen Horton, "Arctic tern and common gull join red list of UK species in crisis," *The Guardian*, 02 September 2024)

Arctic expedition finds deep-sea microbes that could be new type of antibiotics

On 30 August, an article in *LiveScience* informed about the discovery of deep-sea microbes that could lead to the creation of a new type of antibiotics. It is known that substances made by Arctic Sea microbes known as actinobacteria can stop harmful bacteria from growing with 70 per cent of existing antibiotics found in actinobacteria. However, bacteria are becoming increasingly resilient to existing antibiotics, causing a need for urgent drugs. In this light, a study of sea-dwelling actinobacteria or microbes was conducted, with hundreds of unknown compounds analysed and tested to see how they affect a pathogenic type of E. coli known as enteropathogenic E. coli (EPEC). The study into whether compounds produced by four species of bacteria could prevent EPEC bacteria from infecting lab-grown cells found that two compounds had strong antibacterial properties. The Kocuria bacteria produced compounds which were able to slow down the growth of EPEC bacteria, but the Rhodococcus bacteria compound did not; making it a more promising candidate for a new antibiotic. However, bringing either of these compounds to the market still requires more work. Paivi Tammela, Professor of Pharmaceutical Biology at the University of Helsinki stated that there is

still a while before the significance of the compounds in terms of clinical use is known, and how to produce larger amounts of these compounds is still a challenge. Nevertheless, Tammela stated that it is "absolutely" possible several more compounds remain to be discovered. (Emily Cooke, "Arctic expedition uncovers deep-sea microbes that may harbor the next generation of antibiotics," *LiveScience*, 30 August 2024)

CLIMATE CHANGE

Air pollution causing changes in Arctic environment

On 26 September, an article in *earth.com* informed of a Dartmouth College study which showed air pollution from fossil fuel burning altered the atmospheric chemistry of the Arctic regions. According to the study, an increase in fossil fuel-related air pollution led to declines in levels of methanesulfonic acid (MSA). MSA is a byproduct of marine phytoplankton activity, which is required for productive ocean food webs and carbon cycles. While a drop in MSA is often taken as a sign of a declining marine ecosystem, the Dartmouth study showed MSA levels decreased even with stable phytoplankton levels. The study revealed dimethyl sulfide which is produced by phytoplankton transformed into sulfate into MSA as a result of air pollution. This showed misleading figures about a decline in MSA levels. Jacob Chalif, a graduate student and author of the Dartmouth study informed the study showed how air pollution was impacting the environment even in places thousands of miles away. Chalif stated atmospheric processes were being fundamentally altered through the release of pollution. The research showed nitrate pollution from burning fossil fuels was the reason for MSA formation being prevented. Chalif informed expected patterns about the decline in MSA levels contained anomalies, making it more plausible that atmospheric chemistry was the reason for the decline. Erich Osteborg, an Associate Professor of Earth Sciences at Dartmouth College stated greater regulations could help reduce air pollution. The research study showed MSA levels improved in the 1990s after greater regulations in Europe and the US reduced nitrate pollution and stabilized local atmospheric conditions. (Andrei Ionescu, "Air pollution alters the environment in the remote Arctic," *earth.com*, 26 September 2024)

NASA report finds ice levels in the Arctic and Antarctic to be seventh-lowest

On 24 September, an article in *NASA.gov* informed ice levels in the Arctic and Antarctica continued to remain low. According to researchers at the National Aeronautics and Space Administration (NASA) and the National Snow and Ice Data Centre (NSIDC), Arctic Sea ice had melted to near-historic lows in the Northern Hemisphere this summer. In 2024, Arctic Sea ice shrunk to a minimal extent of 1.65 million square miles, about 750,000 square miles below the end-of-summer average of 2.4 million square miles from 1981 to 2010. The sea ice levels in 2024 are the seventh-lowest in satellite record. According to the NSIDC, sea ice coverage has trended downwards since satellite records for ice began in the late 1970s. NSIDC also informed the loss of sea ice has been about 30,000 square miles per year since the 1970s. Nathan Kurtz, the Lab Chief of the Cryospheric Sciences Laboratory at NASA stated the majority of Arctic Ocean ice was thinner, first-year ice which was unable to survive the warmer months. Ice thickness measurements collected with spaceborne altimeters like the ICES at satellite of NASA have found that most of the oldest, thickest ice has already been lost. At the same time, the continent of Antarctica is also witnessing record-low growth for sea ice. The ice around Antarctica is on track to be just over 6.6 million square miles, below the average minimum extent of 7.22 million square miles between 1981 and 2010. Sea ice growth in Antarctica has slowed down since 2014; with scientists believing a long-term

shift in Southern Ocean conditions resulting from climate change to be the cause. Additionally, a phenomenon named ice-albedo feedback exists, wherein water temperatures rise due to more of the ocean being exposed to sunlight, delaying sea ice growth. (Sally Younger, "Arctic Sea Ice Near Historic Low; Antarctic Ice Continues Decline," *NASA.gov*, 24 September 2024)

Antarctic glacier sheet retreats leads to sea-level rise by 65 centimetres

On 24 September, an article in *Euronews* informed the Thwaites Glacier ice sheet in Antarctica was retreating at a high rate. Scientists had stated previously hundreds of millions of people would be impacted adversely from the resulting sea level rise of 65 centimetres; if this glacier were to melt. Rob Larter, a member of the International Thwaites Glacier Collaboration (ITGC) team monitoring the ice sheet stated Thwaites had been retreating for over 80 years. With an acceleration in the past 30 years and a further retreat set to continue. Larter also informed additional processes which had not been studied well enough to be incorporated into large-scale models yet could cause an acceleration in the retreat. According to the findings, the Thwaites Glacier and much of the West Antarctic Ice Sheet could be lost by the 23rd century. Real Ice, a UK startup conducted experiments involving seawater being pumped over ice sheets in the Canadian Arctic. The experiment of the start-up involved drilling through the ice to the ocean below and pumping up water onto the snow above. Andrea Ceccolini, the co-Chief Executive Officer (CEO) of Real Ice informed that the experiment aimed to show ice thickening could be effective in preserving and restoring Arctic Sea ice. Trials conducted by New Ice along with the Centre for Climate Repair at the University of Cambridge resulted in 25 centimetres of natural ice growth on the underside of the ice. (Rebecca Ann Hughes, "A giant Antarctic glacier is melting but scientists have found a way to thicken Arctic sea ice," *Euronews*, 24 September 2024)

Polar bears in Hudson Bay region of Canada bear brunt of climate change

On 24 September, an article in CBC informed the polar bear population in the Hudson Bay region of Canada was rapidly reducing. Geoff York, the Director of Research at Polar Bear International informed the current population of 600 polar bears was about half the number from 40 years ago. A study conducted by York and a group of scientists showed the entire polar bear population in the region could disappear by the end of the century if global emissions did not reduce. The Arctic is witnessing warming temperatures and melting sea ice, which has resulted in the food cycle transforming from high-fat plankton to low-fat plankton. Polar bears depend to a large extent upon fat, especially for mother polar bears nursing their young. However, York informed fewer polar bear cubs were being born or surviving beyond the first year, owing to the lack of fat present in their mothers. Some female polar bears lacked strength for pregnancy as well. Polar bears also utilize the sea ice platforms as bases to hunt for prey like the high-fat seals. However, the rapid disappearance of sea ice was making it difficult for polar bears to hunt for food. Additionally, studies showed bears who hunted for prey on land did not gain a lot of calories due to the usage of energy in hunting. York stated long-term research had shown polar bears were spending up to a month longer on shore without access to food than their parents and grandparents did. Polar bears have a starvation threshold of 180 days, and researchers found that polar bears lost 47 pounds or about seven per cent of their total body weight in just three weeks. A peer-reviewed study conducted by York and Julienne Stroeve, a sea ice scientist at the University of Manitoba found the polar bear population at Hudson Bay would die out, once the Earth warmed by 1.3 to 1.4 degrees Celsius more. Additionally, a fat-heavy water zooplankton named copepods were at risk of declining due to the warming climate. (Seth Borenstein, "Melting sea ice, disappearing high-fat food sources mean trouble for Hudson Bay polar bears," *CBC*, 24 September 2024)

Early ice cover to close vessel navigation in Eastern Arctic

On 24 September, an article in *Bloomberg* informed the Arctic LNG 2 project sanctioned by the Government of the Russian Federation had less than a month left to send liquified-gas cargoes across the Northern Sea Route towards Asia. The Russian government-owned nuclear corporation Rosatom stated the arrival of ice cover earlier than expected in the eastern Arctic had resulted in navigation in that area being closed for non-ice class vessels from 15 October. Arctic LNG 2 had already struggled to ship cargo and find buyers amid increasing sanctions by the US. The project forced to use only lighter vessels instead of more resilient ice-class tankers. The new restrictions have limited export options further. Arctic LNG 2 is still allowed to send cargoes on non-ice class vessels through the western part of the Northern Sea Route. However, this is allowed only until 15 November, under Russian navigation rules. Vladimir Putin, the President of Russia had earlier acknowledged the difficulties from the sanctions; but stated the Government of the Russian Federation would continue with developing its LNG business. While the Russian government plans to expand its presence in the global liquefied-gas market, restrictions imposed by the US and its allies have posed a challenge to Moscow's ambitions. ("Early Ice Build-Up Closing East Arctic to Sanctioned Russian LNG," *Bloomberg*, 24 September 2024)

Number of underground wildfires rise with increased carbon release from Indonesia

On 24 September, an article in *Bloomberg* informed the number of underground wildfires had substantially increased, destroying landscapes and releasing high amounts of carbon from Indonesia to the Arctic. These underground fires are extremely hard to extinguish, and are sometimes located extremely deep with no visible flame. With the Arctic heating up, the wet peat below the surface is drying out. This means the likelihood of these fires occurring has increased. Tim Brown, a professor at the Desert Research Institute stated the factors of climate, fuels and people were all connected in increasing the level of wildfires. Direct human interventions such as the drainage of peatlands for agriculture were exposing vast subterranean deposits to fire risk. (Marc Davies, "Underground Infernos From the Arctic to Indonesia Undermine Climate Fight," *Bloomberg*, 24 September 2024)

Underground wildfires threaten to worsen global warming

On 24 September, an article in *Bloomberg* informed underground wildfires were escalating worldwide, burning up huge stores of carbon and escalating global warming. While wildfires typically flamed upwards, the new type of wildfires moved downwards below the surface, consuming layers of organic material. The low and slow underground wildfires are increasing in frequency worldwide. For instance, the Arctic which is the fastest-warming region in the world is witnessing an increasing number of underground wildfires. The drying out of wet peat, a spongy type of soil made from prehistoric vegetation is adding to the increasing frequency of fires. Johann Goldammer, Director of the Global Fire Monitoring Centre at the University of Freiburg stated the organic material beneath the surface produced a nasty and acidic odour, which helped tell when a blaze had moved underground. The peat fires also accelerate permafrost thawing which releases methane into the atmosphere. This results in the Arctic being warmer. According to scientists, high levels of emissions could result in one-third of the global permafrost disappearing by the middle of the century. Additionally, the fires produce a soot called black carbon which can lead to the heat of the sun being absorbed, and could permanently alter landscapes. The presence of peat also substantially increases the carbon

emissions from a wildfire, as shown by the example of Brazil. The Pantanal and Amazon fires have resulted in the total level of wildfire carbon emissions for Brazil in 2024 exceeding the total level from 2010, as of mid-September. The fires also cause lasting damage which is difficult to extinguish, as shown by the example of the Indonesian peatlands. Additionally, the fires cannot be seen without visible flames, even through satellites (Danielle Bochove, Kyle Kim and Armand Emamdjomeh, "Climate Change Is So Bad, Even the Arctic Is On Fire," *Bloomberg*, 24 September 2024)

Greenpeace organisation warns deep-sea mining threat in Arctic

On 20 September, an article in *Greenpeace* informed of a report by the organization which warned that deep-sea mining plans by the Government of Norway would cause irreversible damage to biodiversity. The report titled Deep Sea Mining in the Arctic: Living Treasures at Risk stated Norway needed to put all its mining plans on hold, to protect the biodiversity. Haldis Tjeldflaat Helle, a campaigner for Greenpeace Nordic stated that Norway was committing actions going against the environment, despite rhetoric to the contrary. Helle informed how deep-sea mining impacted seafloor habitat and organisms, altered the substrate and its geochemicals, released suspended sediment plumes, and caused noise and light pollution, amongst other adverse impacts upon the environment. Helle also stated how the proposed Arctic mining area contained a wide range of diverse species such as stalked jellyfish, tube worms, and marine mammals whose habitats would be impacted by mining. In August, scientists onboard SY Witness, a Greenpeace ship conducted a visual-acoustic survey of cetaceans in the Norwegian Sea. The SY Witness was joined by the MY Arctic Sunrise, a Greenpeace vessel to demand deep sea mining does not begin anywhere globally. Dr Kirsten Young, the Science Lead for Greenpeace Research Laboratories at the University of Exeter stated that the ecosystems of whales and dolphins would suffer permanent damage from the deep-sea mining activities. ("Arctic biodiversity under threat from deep-sea mining plans, Greenpeace report warns," *Greenpeace*, 20 September 2024)

New WMO project plans to improve polar region weather forecasts

On 07 August, the World Meteorological Organization (WMO) announced its new project to increase and improve weather, water, ice, and climate information about the Arctic and Antarctic regions. The project focuses on both scientific and societal issues to help meet the challenges and leverage the opportunities provided by the increased interest in these regions, owing to their raw materials and natural resources. Dina Abdel-Fattah, International Coordinator for the project at the Norwegian Meteorological Institute stated the project aimed to deliver knowledge for the benefit of both society and the wider research community. The project titled Polar Coupled Analysis and Prediction for Services (PCAPS) will run from 2024 to 2028. The range of initiatives by the WMO community to improve climate services and forecasts in the polar regions are in line with the decision by the WMO Executive Council to improve monitoring, advocacy, and collaboration on the cryosphere or frozen water. The project aims to give local communities adequate time to prepare and adapt to changes in weather, to minimize damage caused to people, property, infrastructure, and ecosystems. The polar regions are among the regions most adversely affected by climate change, making the project particularly relevant for the region. Another key aspect of the project is that natural science research and social research will guide and influence by each other. Decision-making, risk assessment, and the value of weather and climate forecasting are among the key topics. Additionally, contact with service providers, indigenous peoples, and other users will be an integral part of the

project. The PCAPS could also expand its reach through collaborations with individuals, companies, and research projects who want to collaborate on the polar themes. PCAPS is a component under WMO's World Weather Research Programme (WWRP), and WWRP's endorsement of projects and initiatives aligning with its goals could help in greater collaborations. ("New WMO project to improve weather forecasts in Arctic and Antarctic," *World Meteorological Organization*, 07 August 2024)

UK Met Office predicts warmer weather soon

On 15 September, an article in *Mirror* informed the UK Meteorological Office had stated the UK would receive warmer weather soon. According to the Met Office, temperatures would climb up to 25 degrees Celsius by 18 September. Jason Kelly, the chief meteorologist for the Met Office informed mild conditions would stay for a few more days. According to Kelly, temperatures would be above average by the middle of next week in most parts of the country, and only the extreme northwest of Scotland is expected to receive rain. The long range weather forecast of the Met Office for 19 to 28 September stated the second half of next week would also be "fine and dry", and most of the UK would witness "spells of sunshine." Forecasters warned cool nights with mist or fog patches are possible, while some regions would witness above average daytime temperatures. According to the forecast, more unsettled conditions may develop widely by the end of September. (Chiara Fiorillo, "UK weather: Met Office verdict on 'Arctic blast'- and whether icy temperatures will continue" *Mirror*, 15 September 2024)

Murmansk witnesses 21 degrees highest since 1938 for September

On 04 September, an article in *Arctic Today* informed that the region of Murmansk could record its highest-ever temperature for the month of September. Gismeteo, the weather monitoring service could report temperatures of up to 21 degrees Celsius for Murmansk on 04 September; with the previous highest temperature recorded in 1938. The increase in Murmansk's temperature comes amidst record-breaking heat in the northern parts of Russia; with the 2023 climate report by the federal body Roshydromet informing that the average annual temperature for Russia had increased 2.5 times more than the global average since the mid-1970s. Siberia, Kola, and northern Arkhangelsk inside the Arctic Circle witnessed the most rapid rise. Several regions in the Arctic have witnessed record levels of heat in recent months; such as Svalbard, mainland Norway and Finland. A study by the Chinese Academy of Science stated that temperature increases in the Arctic region could impact climate beyond the Arctic as well. For instance, some fear escalating rates of ice melt in Greenland and Antarctica could lead to sea level increases and flooding along the Chinese coast; severely impacting cities like Shanghai and Hong Kong. ("September heat record for Murmansk," *Arctic Today*, 04 September 2024)

Svalbard's unprecedented warming becomes a climate crisis

On 30 August, *Daan Van Den Broek* reported that Longyearbyen, Svalbard experienced the third consecutive year of record summer warmth. In 2024, previous records were shattered with the average temperature this summer reaching 8.6 degrees Celsius, which is 3.1 degrees Celsius above normal for 1991-2020. August 2024 was the warmest month ever experienced, with a temperature average of 11.0 degrees Celsius, beating the previous record by 2.6 degrees Celsius. This extreme warmth has had serious implications for the region's glaciers. Most of them no longer have an accumulation zone, and the melt rates are now unprecedented. Professor Xavier Fettweis pointed out that in July, daily surface melt was five times higher than usual. Changes at Svalbard represent an

acceleration in the warming trend due to a series of feedbacks, including the ice-albedo effect and "Atlantification" the increased influence of warm Atlantic waters. Persistent southerly winds, a consequence of unusual pressure systems, contributed to August's extreme temperatures. The rainfall patterns have also altered, for instance, July 2024 received nearly 50 mm of rain, more than double the norm. This combination of heat and rain has further accelerated the glacial melt and makes Svalbard one of the fastest-warming places on Earth. ("Svalbard's 3rd Consecutive Warmest Summer on Record, August Shattering Multiple Records," *Daan Van Den Broek*, 30 August 2024)

Arctic Sea ice approaches annual minimum

On 04 September, a report in *NSIDC* stated that the sea ice extent is approaching its annual minimum as the Arctic summer winds down. This typically occurs in mid-September. On 31 August 2024, the extent stood at 4.55 million square kilometres, the fourth lowest in the 46-year satellite record. While a new record low is unlikely, the ice edge has retreated poleward of its average position in most areas. Through August the pace of retreat averaged 62,000 square kilometres per day, about the overall average. Air temperatures were 2 to 4 degrees Celsius below average over much of the Arctic Ocean, in contrast with the unusually warm conditions in the Barents Sea. The long-term trend remains disturbing at 9.9 per cent per decade and the August ice extent has declined since 1979. Meanwhile, Antarctic sea ice approaches its maximum at 16.86 million square kilometres, the second-lowest on record for late August. These patterns show complex climate dynamics where pressure systems and currents affect both the formation and melting of ice. Such monitoring is, therefore, very important for continued Arctic warming to understand global climate change impacts. ("The race to the bottom," *NSIDC*, 04 September 2024)

Environmental and human factors influence Arctic spatial visibility

On 02 September, an article published in *Nature Geoscience* informed about the impact of growing wildfires in the Arctic and boreal regions. In recent years, unprecedented wildfires have occurred in regions, such as Siberia, Canada, and Alaska. Warm summer temperatures, high lightning activity, shifts in the polar jet stream and changes in snowmelt timing have been cited as factors influencing the wildfires. It is unclear yet why different regions experience different extremes. At a global scale, spatial variability in fire activity across biomes is driven by differences in vegetation, climate, and human impact. Despite several studies, the reasons behind Arctic-boreal regions' variability have not yet been deciphered. However, most studies of contemporary and future-boreal activity have focused on fires in western North America and eastern Siberia, with little attention given to the other boreal regions. The lack of accurate and long-term records of individual fires in many Arctic boreal regions means that studies evaluating Arctic boreal fire activity rely extensively on satellite-derived products of active fires and burned areas. These satellites fail to offer insights into the ignition location and timing, sub-daily spread rate, and temporal evolution of individual fires. Available datasets do not provide full spatial coverage of Arctic tundra and boreal forest biomes and have often not been optimized for fire dynamics in these regions. 26,504 fires were recorded in the Arctic-boreal forest and tundra regions from 2012 to 2021; with a total area of 1.12 million sq. km burned. The largest documented fire was in eastern Siberia in 2021, and the burned area varies from 70,000 sq. km in 2017 to 180,000 sq. km in 2012. An analysis of fire activity patterns in Arctic boreal regions found that hotspot regions in the continental interior of Eurasia and North America, such as in western Canada and central, eastern, and southern Siberia were areas with high fire

frequency. The highest overall burned area was in regions with a high density of fire numbers and large fire sizes. Yakutia and the area around Lake Baikal in Siberia had the highest fire number density while the Northwest Territories and Quebec in Canada and central and northeastern Siberia saw the largest fires. Another difference was in terms of fire intensities with Canada recording the highest radiative fire power, and European Russia and western Siberia witnessing the lowest. With Arctic-boreal regions warming nearly four times higher than the rest of the planet, fire activity in these regions is projected to increase owing to increases in lightning ignitions and decreases in fuel moisture. Regions like Alaska and parts of Canada have already witnessed an intensification of regional fire regimes. The sensitivity of fire activity to a warmer and drier climate varies; since boreal North America, eastern Siberia, and northern tundra regions are more vulnerable to fire activity in comparison to southern Siberia and Europe. Projected increases in Arctic-boreal lightning activity are also driving future increases of fire activity in western Alaska and eastern Siberia. These regions have also experienced recent fire extremes, and rising temperatures may enhance ignition efficiency in currently moisture-limited pyroregions. While the Arctic-boreal regions are moving towards warmer climates, abrupt biome shifts have been observed and projected with major implications for fire regimes. Biome shifts like from open and older stands in Siberian forests to younger and denser stands, and shrub expansions in tundra areas have a more positive impact on fire activity; while others like a transition from flammable conifers to less flammable deciduous forests leave more of a negative impact. Fuel load and fuel type have also been found to be drivers of fire intensity and fire activity. The susceptibility of below-ground peat and permafrost carbon pools towards fires and a warmer climate is also yet to be understood completely, and it is not clear whether they are more resilient towards fire activity and ecosystem shifts. Additionally, activities like agrarian expansion, logging, and resource extraction could also influence fire regimes; either directly through intentional or unintentional ignition and fire suppression and indirectly through fuel management, logging, and fragmentation. The vulnerability of peatlands to fires is also increased through human activities such as land-use changes, and the combination of long-term fire prevention practices in populated boreal regions and a warming climate might increase the fire risk in vulnerable areas. Thus, it is critical to understand the interplay between fuels, the climate, and ignition sources in different regions; alongside better representing fire-induced and fire-suppressed effects of anthropogenic presence in fire models. The fire tracking and classification system developed for temperate and tropical regions could also be extended to include additional vulnerable regions, especially in places with limited fire records. (Rebecca C. Scholten, Sander Veraverbeke, Yang Chen and James T. Randerson, "Spatial variability in Arctic-boreal fire regimes influenced by environmental and human factors," *Nature Geoscience*, 2 September 2024)

Ocean Census expedition to focus on accelerating marine species discovery

An article in *Oceanographic* informed about the Ocean Census Arctic Deep Expedition going beneath the Arctic surface. With the Arctic deep sea becoming a focal point due to deep sea mining, the Ocean Census aims to accelerate the discovery of marine species worldwide, especially in unexplored regions like the Arctic deep ocean. Alex Rogers, Ocean Census Science Director and co-principal investigator of the expedition informed that there were only about 1,100 described species from the Arctic deep sea, making it an important region for the mission. The expedition involved a team of 35 scientists from 15 academic institutions

sailing from Tromso in Norway to the Fram Strait passage west of Svalbard, with depths ranging from 2000 to 3700 metres. The scale and complexity of the mission meant that the team had to be highly selective in their focus, and they targeted an intricate network of geological features with the mid-ocean ridge network west of Svalbard; the largest geological feature on Earth. The expedition first focused on the Jotul Hydrothermal Field, an area of hydrothermal vent activity. One of the findings of the expedition was the 'hairy' decapod shrimp discovered at a depth of 3,000 metres. The unmanned submersible ROV Aurora which is capable of reaching depths of 6,000 metres is at the centre of the mission, and a technological marvel; with both precision and resilience involved. In order to understand the role of the ocean in global climate regulation, the Ocean Census team shifted to looking at 'cold seeps' in later weeks. The expedition into cold seeps saw the discovery of vibrant communities supported by bacteria-methane interactions. The balance between the methane and the ecosystem it supports is affected by rising temperatures at depth, which release vast quantities of methane into the atmosphere. The process of discovering the cold seep also involves utilizing high-resolution mapping and Connectivity, Temperature, Depth (CTD) sensor data along with sonar to create detailed maps that guide the ROV. Species discovered included a threadfin snailfish and a small limpet. While the Ocean Census has accelerated the species discovery process, it still requires effort to transform samples into documented new species. (Jack Hogan, "Life in the Arctic deep," *Oceanographic*)

Atlantic-Arctic water mixing plays a critical role in global climate change

On 01 September, *Space Daily* reported that a study has brought into focus the interaction of the waters of the Atlantic and Arctic Oceans as playing a crucial role in sustaining the Atlantic Meridional Overturning Circulation (AMOC), a key driver of the Earth's climate. Analysis of more than four decades of ocean data revealed that the cold, dense waters flowing southward-making up the lower limb of the AMOC are comprised of 72 per cent Atlantic waters and 28 per cent Arctic waters. They give off heat when reaching the cooler North Atlantic, cooling, becoming denser, and then sinking. The dense water then travels northward, where it mixes with colder, fresher Arctic waters, making it even denser before flowing southward, feeding into the strength of the AMOC. This mixing accounts for 33 per cent of the transformation from warm, salty water to colder, fresher, and denser, while the remaining 67 per cent is caused by ocean-atmosphere interactions. This goes against the initial assumptions that, with adequate representation of these water mixing processes, the future climate scenario can be well-forecasted in the models. As a result of the warming and freshening ocean surface, this stratification may impede this crucial mixing and lead to the weakening of the AMOC, along with dramatic and irreversible changes in Earth's climate. (Sophie Jenkins, "The critical role of Atlantic-Arctic water mixing in global ocean circulation uncovered," *Space Daily*, 01 September)

DEFENCE & SECURITY

Russia deploys two nuclear submarines under Arctic polar icecap

On 17 September, an article in *News X* informed Vladimir Putin, the President of Russia had deployed two nuclear submarines under the Arctic polar icecap. The Emperor Alexander III, a strategic ballistic submarine with Kalibr hypersonic missiles and the Krasnoyarsk Yasen-M class nuclear attack submarine embarked on a "subglacial march" together. This was a part of the Ocean 2024 strategic military exercise and war games across six seas in the Arctic region including the Caspian and Baltic Seas, the largest naval exercises since the Cold War. The Chinese People's Liberation Army(PLA) Navy was also involved in some drills, signalling growing cooperation between Russia and China. The Government of the Russian

Federation has been making efforts to modernize its nuclear submarine fleet, with Krasnoyarsk, a Yasen-M class multipurpose submarine joining the Pacific Fleet. Five additional Yasen-M submarines are also in construction, with three more expected to begin construction in the coming years. The Imperator Aleksandr III, a Borei-class ballistic missile submarine joined the Pacific Fleet, the fifth Borei-class submarine to join that fleet. Russia has also been upgrading its other submarines, such as the Delta-IV class submarines. (Zubair Amin, "Putin Sends Two Nuclear Submarines Under Polar Icecap In Arctic," *News X*, 17 September 2024)

USAFE expands Arctic surveillance with advanced drones and innovative technologies, reports *Air & Space Forces Magazine*

On 18 September, *Air & Space Forces Magazine* reported that the US Air Forces in Europe (USAFE) is stepping up its Arctic overwatch through the employment of unmanned aerial vehicles, such as the MQ-9 Reaper and RQ-4 Global Hawk. These are being used to push beyond the Arctic Circle. The commander of USAFE Gen. James B Hecker stated at the AFA's Air, Space & Cyber Conference that some experimentation is being done in those platforms. The command recently forward-deployed an RQ-4 to RAF Fairford as it pushes to expand operations through allied airspace. It is also pursuing high-altitude balloons and solar-powered drones for domain awareness over this critical region. "Sky Fortress" for low-level surveillance is one of the systems that interested Gen. Hecker, which he identifies as cost-effective and successful in countering Russian drones. The enhanced Russian aircraft activities and the more coordinated Moscow-Beijing machinery present drivers for better Arctic ISR. The NATO expansion of Sweden and Finland focuses attention on even better surveillance capabilities. As Norwegian Air Force Maj. Gen. Øivind Gunnerud underscored the regular intercepts by Russians, Swedish Air Chief Maj. Gen. Jonas Wikman stressed better leverages of new NATO geography to deter effectively. (Unshin Lee Harpley, "USAF Experiments with Drones to Better Monitor Russia in the Arctic," *Air & Space Forces Magazine*, 18 September 2024)

NATO enhances Arctic defences amid rising Russian presence

On 18 September, *National Defense* reported that the Arctic's strategic importance has grown due to receding ice, prompting NATO to strengthen its defences against increasing Russian activity. The commander of US Air Forces in Europe Gen James Hecker, said he is concerned over the growing Russian presence in the Arctic, from its northern fleet, though mostly based in Murmansk in western Russia, to increased domain awareness capabilities. The alliance is contemplating the opening of a third Combined Air Operations Center in the Arctic region. Lt Gen Case Cunningham highlighted the additional threat of Russia providing China access to the Arctic, as evidenced by recent joint bomber patrols. In a move to mitigate those challenges, NATO is playing off its nation members with Arctic experience and researching new ways of surveillance. Gen Hecker championed plans to move MQ-9s and Global Hawks north, to begin researching high-altitude balloons, and ISR drones. Information sharing is absolutely necessary between NATO allies, with Hecker emphasising: "If we share that information, that's going to give us a lot more than we have." The recent addition of Sweden and Finland into NATO is expected to be that their participation will greatly enhance the Arctic capabilities and deterrence capability of the alliance. (Laura Heckmann, "AFA News: NATO Considering Arctic Air Operations Center to Counter Russia, China," *National Defense*, 18 September 2024)

Environmentalists file lawsuit against Arctic oil progresses

On 19 August, an article in *WebWire* informed about climate activists and organizations in Norway submitting additional arguments to the European Court of Human Rights (ECtHR). The arguments relate to an application filed in 2021, against fossil fuel expansion in the Arctic

region by the Government of Norway. The petitioners in the case are six young climate activists, alongside the environmental organizations Greenpeace Nordic and Natur og Ungdom or Nature and Youth. The lawsuit against the Norwegian government had initially been filed in the domestic courts of Norway. The argument by the organizations and activists was that the Norwegian government's expansion of oil and gas extraction in the Arctic amidst the climate crisis violated the Constitution of Norway. However, after the Supreme Court of Norway ruled against them, the activists and organizations filed their appeal before the ECtHR. A key argument put forth by the applicants is that the Norwegian government continuing with oil expansion violates the right to life and right to private and family life, protected under Articles 2 and 8 of the European Convention on Human Rights (ECHR). The applicants also argue that Article 14 of the ECHR is violated; since the actions discriminate against youth who face a lifetime of extreme climate event and the indigenous Sami people whose cultural rights and historical traditions are under threat. The applicants are requesting that the ECtHR hold national governments responsible for greenhouse gas emissions resulting from the combustion of their oil and gas exports, regardless of where the emissions occur. Frode Pleym, the head of Greenpeace Nordic stated that the ECtHR's review of their case highlighted how climate change was affecting climate change. According to Pleym, Norway's fossil fuel expansion in the Arctic during the climate crisis violated human rights which were protected by the European Convention on Human Rights. Pleym also described the issue as an environmental and human rights issue affecting everyone. The current lawsuit against the Norwegian government forms part of a wider movement of climate litigation, aimed at holding governments and organizations accountable for their actions. In April 2024, the ECtHR ruled for the first time ever that inaction by a national government vis-à-vis climate was in breach of human rights. ("Youth and environmentalists' climate lawsuit against Arctic oil progresses in the European Court of Human Rights," *WebWire*, 19 August 2024)

Greenland lost a third of glaciers says an opinion in *Dialogue Earth*

On 04 September, an opinion in *Dialogue Earth* stated that the Arctic has now reached a never-imagined phase of meltdown. The minimum extent of sea ice is declining, while glaciers in Greenland have lost a third of their volume since 1978. Impacts can be expected in a cascade of effects right from the far northern areas down to more distant areas. Such accelerated thaw carries planetary risks so the IPCC has warned. Glaciers in the Arctic and Antarctica are responsible for about 21 per cent of sea level rise around the planet since the turn of the millennium. It is a very serious threat to coastal areas around the world, from the United States to Southeast Asia. Disturbing currents in the ocean disrupt the CO2 cycle, hastening global heating and with very wide-ranging implications for weather patterns throughout the developing world. But beneath the melting ice lie also huge energy resources, entailing geopolitical tensions given grasping countries trying to access them at the cost of world decarbonisation. In the wake of an opening Arctic, "non-Arctic powers" try to find commercial alliances for this purpose and are striving to reshape global geopolitics. Similarly, the effective international cooperation and governance that will be developed regarding the presented challenges and opportunities of the transformation of this region so quickly and right at the epicentre of climate change should have much to offer. (Felipe Arango García, "Climate change in the Arctic is a wake-up call for the Global South," *Dialogue Earth*, 04 September 2024)

Russian politician proposes building

prison in Arctic

On 04 September, an article in *Arctic Today* informed that Ivan Sukharev, a Member of the Russian Parliament or Duma had proposed building a high-security jail in the Arctic. According to Sukharev, the prison must be located at either Svalbard or the Novaya Zemlya; and will be for detaining "terrorists." Russian news agency RIA Novosti informed that Sukharev had stated that the remote isolation of the Arctic would curb "spreading of extremist views among inmates" and "terrorists have no nationality or religion," making it the perfect place. Sukharev, who is a strong supporter of the Government of the Russian Federation; has sent a letter to the leader of the Russian Federal Penitentiary Service proposing the Arctic prison. The politician stated that building the prison was about ending "terrorism" and protecting the national security of Russia. (Atle Staalsen, "Russian lawmaker wants to build a prison for 'terrorists' at Svalbard," *Arctic Today*, 04 September 2024)

Kirkenes bolsters civil defence amid changing security landscape

On 04 September, *Arctic Today* reported that the most recent civil preparedness exercise in Kirkenes, a border town in northern Norway, highlighted how emergency preparedness has become a bigger concern. Police, fire brigade, and health personnel participated in joint simulated crises with local high school students. The head of the local Civil Defence Terje Meyer said: "Whether there is peace, crisis or war, we have to take care of the population if something happens." The proximity to Russia and the Ukraine conflict has raised awareness of the potential threat. Meyer said: "We see how civilians in Ukraine are exposed to bombing and missile attacks almost every day," and "It gives us some perspectives about the job we are doing and what it means." The exercise underlined Kirkenes' mountain shelter, which can accommodate 3,000 people and has taken on new significance since the war started. Although the exercise was not particularly about Russia, it is part of a broader trend-increasing preparedness in the region from climate change to geopolitics. ("'People in Kirkenes understand that these are new times'," *Arctic Today*, 04 September 2024)

DIPLOMACY

France's Polar Ambassador calls for new action to broaden vision of Polar Strategy

On 04 September, an article in *Polar Journal* informed about an interview conducted with Oliver Poivre d'Arvor, the Ambassador for the Poles and Oceans of France. Poivre d'Arvor was returning after the declaration of the Decade of Action for Cryospheric Sciences by the United Nations General Assembly. The declaration was after the Paris Appeal for the Poles and Glaciers. In the interview, the Ambassador stated the French Polar Strategy aimed to build a major international event; with which they had succeeded. He also informed that the Government of France would organize an event at UNESCO headquarters. According to Poivre d'Arvor, it was up to individual countries now to come up with new methods of cooperation. He also stated the polar and glacial issues were now brought together, through the disappearance of ice caps and escalating climate change. He informed that the new actions would broaden the vision of a polar strategy; which did not just include members of the Arctic Council. The Ambassador also informed this was the first time the international community had reached an agreement on the topic of ice disappearing at the UN level. The Ambassador also stated that the French Government would expand its activities in Antarctica. He informed EUR one billion would be invested towards ministries focused on polar affairs. He also informed about the Tara Polar Station vessel being made ready in the coming months. (Camille Lin, "'It's major, because it brings the polar subject closer to the glacial," *Polar Journal*, 04 September 2024)

US sanctions tighten grip on Russia's

Arctic LNG 2 project

On 09 September *Financial Times* reported that the US has substantially escalated sanctions against the Arctic LNG 2 project in Russia, hitting significant companies and vessels involved. Among them Gotik Energy Shipping and vessels like New Energy and Energy Mulan are accused of misleading to circumvent sanctions. The sanctions, though imposed by the Treasury Department's Office of Foreign Assets Control (OFAC), have also extended to non-Russian counterparts, including Turkish companies Denkar Ship Construction and ID Ship Agency, for providing services to Russian interests. As analysts say, transferring LNG ship-to-ship is one tactic Russia has used-sometimes in under-surveilled spaces to keep on with exports. Yet, according to data from Kpler, this puts buyers off due to the associated risks. With Western buyers blocked by sanctions, possible customers such as India and China might still import Russian LNG but at a discount. An energy expert Sergey Vakulenko said: "It is definitely an uphill battle for Novatek." Such grand plans for LNG production are already difficult to achieve as sanctions have reached into future projects at Arctic LNG 1 and 3, crippling further development of the country's energy sector. (Shotaro Tani and Chris Cook and Anastasia Stognei, "Vladimir Putin's flagship Arctic gas project struggles to lure customers," *Financial Times*, 09 September 2024; "Sanctions: Russian maneuvers to exploit the Arctic fail," *Energy News*, 06 September 2024)

Arctic conference calls for closer Nordic cooperation

On 04 September, an article in *Arctic Today* informed that experts had stated that the Nordic nations needed to expand their cooperation with each other; on the occasion of a panel discussion titled 'Nordic Cross Border Cooperation in the New Geopolitical Context' during the Arctic Frontiers Abroad Conference. Maria Varteressian, State Secretary for the Ministry of Foreign Affairs of Norway stated that no nation could afford to stand alone in the current geopolitical environment. Harri Martikanien, Director-General of the Government Strategy Department at the Prime Minister's Office of Finland informed that there needed to be productive collaboration and cooperation between the regional, national, and international levels; in order for successful outcomes. Varteressian stated that the national governments needed to provide strong support to local and regional development; and empower local efforts. She also acknowledged that border challenges remained, and cross-border collaboration needed to be achieved in a streamlined manner. Martikanien stated that a holistic approach was the best way forward; since that would integrate the various sectors into a comprehensive Northern policy with a broader strategy considering both economic and societal needs. A point of agreement amongst the panel was that cooperation and collaboration amongst the Nordic nations; with both local and regional actors involved was required for success. (Elias Thorsson, "Experts call for closer Nordic cooperation at Arctic Frontiers Conference," *Arctic Today*, 04 September 2024)

China's expanding influence in the Arctic raises global concerns, says an opinion in *Bitter Winter*

On 03 September, an opinion piece in *Bitter Winter* stated that China's growing interest in the Arctic since Beijing's admission as an Observer to the Arctic Council in 2013 has given cause for international alarm. Whereas China's 2018 Arctic policy paper did much to express respect for Arctic states' sovereignty, it equally expressed China's right as a non-Arctic state to take part in regional governance. This therefore signalled a push for the internationalisation of the Arctic. China's involvement in the Arctic, including not only its cooperation with Russia but also its initiative called the "Polar Silk Road," points to a wider ambition beyond scientific research to more

commercial activities. The incident that occurred in Norway underlines the concerns of the Norwegian government prevented the sale of privately owned property on the Svalbard archipelago to block Chinese ownership, reflecting concerns that China could use its economic heft in trying to reshape Arctic norms. According to a lawyer Per Kyllingstad, China has wanted the Arctic for a very long time, and underlined the geopolitical value of this "last private land in the world's high Arctic". The case testifies to how Beijing's Arctic strategy framed in cooperative language contains significant security and sovereignty challenges for Arctic nations. (Marco Respinti, "China's "Polar Silk Road." 1. How Beijing Expands in the Arctic," *Bitter Winter*, 03 September)

ENERGY

US Government approves new commercial-scale offshore wind energy project

On 05 September, the *US Department of the Interior* informed the United States Government had approved the Maryland Offshore Wind Project. This is the tenth commercial-scale offshore wind energy project approved by the administration of Joe Biden, President of the United States. The Maryland Offshore Wind Project has three planned phases, which include the proposed installation of up to 114 wind turbine generators and up to four offshore substation platforms. It is also estimated that the project has the potential to generate over 2 gigawatts of clean and renewable energy for the Delmarva Peninsula, alongside powering over 718,000 homes. Estimates also suggest that the development and construction of the project alone could support nearly 2,680 jobs annually over seven years. The Interior Department has now approved more than 15 gigawatts of clean energy from offshore wind energy projects. This amounts to about half of the capacity required to achieve President Biden's goal of 30 gigawatts of offshore wind energy by 2030. The approved projects will power 5.25 million homes across the United States. Laura Daniel-Davis, the Acting Deputy Secretary of the Interior stated that this was another important milestone towards the objective of 30 gigawatts of offshore wind energy. Ali Zaidi, National Climate Advisor of the White House stated that the offshore wind industry of the US had been jumpstarted, and it was strengthening supply chains, and creating tens of thousands of well-paying jobs. Biden had issued an Executive Order for the building of a new American infrastructure and clean energy economy, which would boost employment and the wind industry. The Biden administration's goal of deploying 30 gigawatts of offshore wind in the US by 2030 is expected to trigger over USD 12 billion per year in capital investment in projects along US coasts. It is also believed that meeting the goal will lead to over 44,000 workers employed in offshore wind by 2030, and nearly 33,000 additional jobs in communities being supported by offshore wind activity. The Bureau of Ocean Energy Management (BOEM) has also developed measures towards minimizing, mitigating, and avoiding the potential environmental impacts of the projects. BOEM developed these measures based on feedback and reviews received from project stakeholders, such as tribal countries and commercial fishing interests. ("Biden-Harris Administration Marks Major Milestones for Offshore Wind, Approves Tenth Project," *U.S. Department of the Interior*, 05 September 2024)

Tokyo startup highlights Helsinki's innovative energy-harvesting glass says an editorial in *Arctic Today*

On 03 September, an editorial in *Arctic Today* reported that the most exciting collaboration between Tokyo and Helsinki is the King Salmon Project, a promotional endeavour for technological innovations. Among the startups participating in this project, inQs has been in the limelight with SQPV glass, a transparent energy-harvesting solution perfect for northern climates. This innovative product, which received an award recently at CES, captures light across the spectrum and offers strong insulation

properties. The inQs' Chief International Officer Rike Wootten said: "We don't make a lot of power," but stresses the glass's versatility for powering sensors and small devices in smart city applications. He stated that the technology is well-suited to Helsinki's long winter nights since it generates energy in low-light conditions. But the company's CEO, Tomoko Ito explains that from an environmental point of view: "You generate just a little bit of power, and you use it right where you generate it. There are no wires and when you're done with the product, you simply recycle it." As inQs await the competition results they are already looking forward to returning to Helsinki for Slush, eager to test their concept in challenging weather conditions. (Laurel Colless, "Fishing for Partnerships: "King Salmon Project" Brings Tokyo Tech Startups to Helsinki," *Arctic Today*, 03 September)

Alaska pioneers energy storage innovation with cache energy's limestone pellets, says an editorial in *Arctic Today*

On 04 September, an editorial in the *Arctic Today* reported that Cache Energy is bringing a new solution as Alaska struggles to shift towards renewable energy sources. The company founded by Arpit Dwivedi relies on a peculiar storage system that utilises pellets derived from limestone to store excess renewable energy produced by wind and solar installations. This technology, backed by Halliburton, promises a far more sustainable replacement for those fuels. Cache's system heats the pellets using renewable energy, storing them until it is needed. The pellets can remain charged but not spent for a very long time, even in Arctic conditions. Dwivedi said: "Cache was inspired by fossil fuels." and that it has stability and can be transported. Alaska-most recently, plans call for testing in Kotzebue-serves as a perfect proving ground. The utility manager for Kotzebue Tom Atkinson said: "Renewable energy has worked well. But wind and solar and batteries have only gotten us so far. Now we have to figure out other systems that will take us further." This development aligns with global efforts to build up energy storage capacity and demonstrates Alaska's potential role in solving critical challenges in the renewable energy transition. (Nathaniel Herz, "In Anchorage, a coal-inspired startup could help pave the path to wind and solar," *Arctic Today*, 04 September 2024)

GEOENGINEERING

Geoengineering required to preserve Arctic ice says as editorial in *NewScientist*

On 25 September, an editorial in *NewScientist* informed geoengineering was the only method through which the increasing rates of ice shedding in the Arctic could be tackled. The Arctic has been shedding ice at rates of 12 per cent per decade, while Antarctic Sea ice hit a record low in 2024 for the second straight year. Real Ice, a start-up plans to reverse the dire situation through the usage of seawater to thicken the Arctic ice. This would help preserve the white ice caps of the polar regions, which reflect solar radiation back into space, helping maintain the cool atmosphere of the Earth. The loss of Arctic Sea ice also triggers extra global warming. While there are risks associated with geoengineering and opponents state cutting down on emissions must be the priority, the editorial argued it is an essential step required to protect the poles. The editorial stated refreezing the poles was the most benign option available, to avert disaster. ("Geoengineering is now essential to saving the Arctic's ice," *NewScientist*, 25 September 2024)

GEOPOLITICS

US, Canada begin negotiations over oil-rich Arctic seabed

On 24 September, an article in *Bloomberg* informed on the agreement between the US and Canada to start negotiations over claims to an Arctic seabed believed to contain substantial oil reserves. Both

countries have overlapping claims to the seabed containing oil reserves situated to the north of the US state of Alaska and the Canadian territories of Yukon and Northwest Territories. An anonymous source informed the US State Department and Global Affairs Canada would announce a joint task force to negotiate the boundary of the Beaufort Sea. The US Government and the Government of Canada are also expected to announce a joint statement that they will work collaboratively towards a final agreement to clarify their Arctic maritime boundaries. The Arctic has become a subject of interest owing to the impacts of climate change, and growing interest from Russia and China. (Laura Dhillon Kane, "US, Canada to Negotiate Boundary to Potentially Oil-Rich Arctic Seabed," *Bloomberg*, 24 September 2024)

Russian Foreign Minister accuses NATO for aiming to gain legitimacy in the Arctic

On 19 September, the *Ministry of Foreign Affairs of the Russian Federation* published an interview conducted with Sergey Lavrov, the Minister of Foreign Affairs of the Russian Federation, for the Soviet Breakthrough semi-documentary series project. In the interview, Lavrov stated that countries in the North Atlantic Treaty Organization (NATO) treated the Arctic as their property. According to Lavrov, NATO member states wanted to globalize and gain legitimacy as a global policeman. According to Lavrov, the Government of the Russian Federation was prepared to protect its interests at a military and technical level against NATO. Lavrov informed how the Arctic Council session in May 2023 had been attended by all the eight member states, and a joint statement emphasizing upon the need for a peaceful Arctic to be preserved was approved. The foreign minister also stated that non-Arctic nations like China and India were willing to work in cooperation projects in the Arctic. Lavrov also stated that present developments around the Arctic were not a struggle, but rather negotiations aimed at achieving a balance of interests. Lavrov also informed that the 1982 UN Convention on the Law of the Sea had laid out the delimitation procedure vis-à-vis the delimitation procedure for the Arctic continental shelf ("Foreign Minister Sergey Lavrov's interview for the Soviet Breakthrough semi-documentary series project, Moscow, September 19, 2024," *Ministry of Foreign Affairs of the Russian Federation*, 19 September 2024)

Germany reveals new interministerial Arctic policy guidelines

On 18 September, the *Federal Foreign Office of Germany* informed of the new interministerial Arctic policy guidelines adopted by the Federal Cabinet of Germany. The guidelines are a response to the Zeitenwende or turning point reached after the Russian invasion of Ukraine. Increasing cooperation between China and Russia in the Arctic, alongside escalating climate change, poses a threat. The aim of these guidelines is to protect security and stability in the Arctic. The guidelines aim to determine the direction of German Arctic policy in international negotiating platforms. They also offer a sense of awareness for future research activities with German involvement and economic activities in the Arctic involving German companies. The guidelines are also committed to strengthening the rules-based international order and Arctic resilience. Other key points mentioned in the guidelines include a commitment to the sustainable development of the Arctic in line with the precautionary and polluter-pays principles, and expanding responsible research as the basis for political action. A commitment to systematic climate and environmental actions in line with the Paris Agreement. Taking the interests of the indigenous residents into account while making policies for the Arctic region, alongside safeguarding their rights to freedom, good health, and self-determination in their habitat are other important points mentioned. ("Germany's

Arctic policy guidelines: Germany and the Arctic in the context of climate change and the Zeitenwende," *The Federal Foreign Office of Germany*, 18 September 2024)

Rapid melting in the Arctic to give rise for global power conflicts says an opinion in *The Telegraph*

On 13 September, an op-ed in *The Telegraph* stated climate change was having more than an environmental impact; since it was impacting global security. According to the op-ed, the Arctic region was melting rapidly, leading to sea lanes and hidden oil and gas reserves becoming sites of conflict between great powers. The op-ed cites the example of how the Government of the Russian Federation was projecting strength along the Arctic corridor by building infrastructure, civilian outposts, and ports in the region. However, the op-ed informed the geography of the Kola Peninsula would hamper Moscow's ambitions. The op-ed informed how the historically neutral Government of Norway was also increasing its defence spending, moving away from a policy of maintaining cordial relations with Russia while following a deterrence policy. Another point noted in the op-ed is the contradictions in Norway's actions. The country has set a goal of being carbon-neutral by 2050, while simultaneously being one of the largest oil and gas exporters in the world. The op-ed states how the Norwegian government continues to produce oil and gas which is melting the Arctic ice. The op-ed also critiques the Government of Poland for spending on military infrastructure, instead of carbon-neutral infrastructure. The op-ed also mentions how the Government of the People's Republic of China is being more proactive in the Arctic. According to the op-ed, the NATO alliance must take the initiative by tackling climate change as a serious problem. The op-ed also informs Norway and other NATO members must prioritize protecting the climate over their military capabilities. The op-ed concludes by stating the twin crises of climate change and the militarization of the Arctic need to be tackled, for the planet. (Carol Schaeffer, "Troubled thawing," *The Telegraph*, 13 September 2024)

Russia and China strengthen Arctic shipping routes amid rising trade and sanctions

On 05 September, a study in *The Jamestown Foundation* stated that the Arctic Express route, launched in July 2024 as part of the Russian-Chinese "Ice Silk Road," is meant to develop the shortest shipping route from the Pacific to the Atlantic via the Arctic. The project underlines deepening collaboration between Moscow and Beijing, considering China the NSR as a strategic complement to the Belt and Road Initiative. The Arctic Express now reduces cargo delivery time from Moscow to China by 35 to 55 per cent, and 12 shipments are scheduled by the end of 2024. Trade between Russia and China, buoyed partly by Western sanctions against Russia, reached USD 240 billion in 2023. While Russia is developing infrastructure along the NSR, including an extension to St Petersburg, Rosatom faces the challenges of processing growing traffic while simultaneously bypassing areas particularly vulnerable to NATO states. For China, on the other hand, the NSR gains significance as tensions in the South China Sea spiral out of control, offering safer alternatives for sea trade. (John C. K. Daly, "China and Russia Expand Cooperation on Arctic Transit Infrastructure," *The Jamestown Foundation*, 05 September 2024)

Norway cautions on rising threat of conflict due to global warming in the Arctic

On 04 September, an article in *The National* informed that the Government of Norway had warned that increasing global warming was increasing the risk of conflict in the Arctic region. Anne Marie Aanerud, State Secretary at the Ministry of Defence for the Kingdom of Norway stated that the strategic importance of the Arctic region meant great power competition was likely to escalate. According to Aanerud, the sea ice melting and temperatures rising were making the Arctic more accessible, leading to increased

civil and military activity. Aanerud also informed that more activity in the Arctic would increase the risk of "misunderstanding, accidents, and unintended escalation." She informed how a "very significant amount" of Russia's nuclear capability was now close to the Norwegian border, and owing to the increased threat the country had embarked on a rearmament programme. Norway's defence spending is to be doubled to EUR 45 billion over the next 12 years; while the country is also arming itself with drones, satellites, six new submarines, new stealth jets, air defence systems, and five new warships. Aanerud stated that this "innovative strategy" would help Norway in defending its neighbours. (Thomas Harding, " Norway warns melting Arctic ice increases chance of major conflict," *The National*, 04 September 2024)

INFRASTRUCTURE

Economic and demographic challenges to be addressed for development in the Arctic

On 05 September, an article in *Arctic Today* informed that the North Calotte region of the Arctic was facing economic and demographic challenges, which could hinder its development. The region which encompasses the northern parts of Norway, Sweden, and Finland is facing the challenges of migration, uneven economic growth, and a declining population; which have the potential to hamper its overall growth. The major issues facing the region were highlighted by Andrey Mineev, a doctoral researcher at the High North Centre for Business; during a lecture titled 'Investment and Business Opportunities in the Northern Parts of Finland, Sweden and Norway' at the Arctic Frontiers Abroad Conference. Mineev stated that the northern regions were witnessing a population decline, especially outside major cities with universities; and warned that this trend could negatively affect future business and investment opportunities. Alexandra Middleton, Assistant Professor at the Department of Economics, Accounting and Finance at the Oulu Business School stated that while the big cities with university centres were growing; the smaller municipalities were shrinking. Middleton also informed that the only demographic witnessing growth was the one aged 60 and above, and the decline in the youth and working-age population was threatening the long-term sustainability of the region. Additionally, Middleton stated that only big cities with universities were witnessing a growth in population; raising the question as to how the northern Arctic regions could reverse the trend and emerge as an attractive proposition for migrants. A key argument put forth by Middleton and Mineev was that the northern Arctic region must move towards a knowledge-based economy, and leverage its strengths in sectors like space technology and circular economy rather than relying upon traditional sectors like mining and manufacturing. However, both of them also stated that the demographic problems needed to be addressed effectively for the Arctic region to develop. (Elias Thorsson, "Economic challenges and population decline threaten Nordic Arctic development," *Arctic Today*, 05 September 2024)

Russian shadow fleet operates in the Arctic without permits

On 03 September, an article in *High North News* informed that the Government of the Russian Federation was continuing to expand its Liquified Natural Gas (LNG) shadow fleet in the Arctic. Over the past four weeks, three Russian LNG carriers all of whom were about 20 years old travelled up the Norwegian coastline; and entered the western part of the Northern Sea Route (NSR) without holding permits. After loading cargo, the vessels exited the route, with their journeys not logged by the NSR Administration. To curb these actions; the US State Department sanctioned all of the vessels, their registration was temporarily suspended, and the permit information for four other Russian vessels was removed from the NSR Administration website.

Frederic Lasserre, Professor of Political Geography and Geoeconomics at Laval University stated that Russia had a strong will to develop its shipping, amidst sanctions from the Ukraine war. While discussions around the NSR had earlier revolved around safety more; Russia's illegal actions have brought the question of violating rules to the forefront. The lack of ice-class tankers and increasing sanctions have compelled the Russian government to increasingly use unsafe vessels and ignore regulatory measures. According to Lasserre, Russia's desire to keep exporting had led to LNG tankers operating in the dark fleet vessels operated by companies trying to avoid sanctions. Lasserre also informed that the Russian refusal to share data could make vessels without permits traversing the waters the new normal. (Malte Humpert, "Safety Takes a Backseat as Russia's LNG 'Shadow Fleet' Operates in Arctic Without Permits," *High North News*, 03 September 2024)

China's strategic ambitions in the Arctic raise global and environmental concerns says an opinion in *Khaama News Agency*

On 02 September, an opinion piece in *Khaama News Agency* stated that China's growing involvement in the Arctic has triggered an alarm globally because Beijing tends to extend influence much beyond its borders. Since the status of Observer to the Arctic Council was granted to China in 2013, it has continued to affirm that although it operates within the framework of commitment to governance regarding the Arctic, it wants to exercise its right as a non-Arctic state to participate in regional affairs. Combined, these two approaches imply an internationalisation of Arctic governance-a development the Arctic states are suspicious about. China's policy in the Arctic, as outlined in the 2018 white paper does not reveal significant aspects, including national security, which is probably the driving factor behind Beijing's interest in the region. China officially recognises the sovereignty of the Arctic states, while using international law to bolster its growing presence. The joint statement of the People's Republic of China and the Russian Federation in 2022 emphasised the further development of cooperation in the Arctic. This reflects geopolitical changes in the region, considering that a weakened Russia is becoming increasingly dependent on China. China's interests range far beyond scientific research. It seeks to establish a "Polar Silk Road" from Europe to Asia via the Arctic-for facilitating resource extraction and shipping routes. Yet this growth also raises environmental and indigenous rights concerns. Chinese investments in the Arctic have the potential to increase the impacts of climate change and disruption of local ecosystems. China's approach to the Arctic indigenous peoples is also complicated, reflecting both its domestic policies on ethnic minorities and often completely ignoring indigenous rights in its international actions. While Arctic states have to grapple with the rising Chinese influence, this calls for more stringent scrutiny of investments by the Chinese in critical infrastructure and natural resources. This is especially true with growing security and environmental concerns in this fragile polar region. (Noman Hossain, "Chinese Arctic Ventures: A new threat to climate change vulnerabilities," *Khaama News Agency*, 02 September 2024)

RESEARCH & DEVELOPMENT

Study by GFDL reveals Southern Ocean's crucial role in climate change

On 10 September, a study in *GFDL* stated that the Southern Ocean, despite its small size, plays a pivotal role in absorbing heat and carbon from human activities. New research results from two coupled models, namely CM4 and ESM4, tell us about crucial changes in wind patterns relative to the melt of Antarctic ice. The warming of Antarctica will cool most of the surface of the Southern Ocean in such a climate-changing scenario, except the Weddell Sea, which warms due to the associated change in wind stress. Subsurface ocean temperature projection along the West Antarctic shelf is divergent between the

models. The differences in the representation of the Antarctic Slope Current underscore that this shows significance for the particularisation of local water dynamics. The study strongly recommends improvements to the modelling of the ASC, especially with the real-time two-way coupling of interactive ice sheet models with ocean models, to enhance confidence in projections of sea-level rise and other climate change impacts over the entire globe. ("Importance of the Antarctic Slope Current in the Southern Ocean Response to Ice Sheet Melt and Wind Stress Change," *GFDL*, 10 September 2024)

China expands research in Svalbard

On 10 September, an article in *Arctic Today* informed the Government of the People's Republic of China was increasing its focus on Svalbard; amidst an increase in interest in the Arctic region. Professor Marc Lanteigne, an expert on China's Arctic interests from the Arctic University of Norway stated Svalbard was growing in importance for Beijing; with Chinese research interests in Greenland and Canada being curtailed. Lanteigne stated the Chinese government was critical of protocols by the Government of Norway, which requested research to be restricted to natural science. According to Lanteigne, Beijing is also concerned Norway is trying to expand its oversight of research activities on Svalbard. China already has a station in Svalbard; in the Arctic Yellow River Station in Ny-Alesund. Russia has also expressed an interest in expanding its research in Svalbard. However, the Government of the Russian Federation runs its research from Barentsburg. Lanteigne stated Russia is considered to be an important partner by China in trying to understand the high north better. Lanteigne also informed China might prioritize the research network built by Russia more, due to Norway scrutinizing its activities. Vladimir Putin, the President of Russia had Arctic shipping as one of the topics on his agenda when he visited Xi Jinping, the President of China earlier this year. In August, The Arctic and Antarctic Research Institute informed diplomats from the Chinese Consulate-General in St. Petersburg had discussed with the institute, the possibilities of strategic cooperation between China and Russia in Arctic studies. The institute also informed the implementation of joint projects on board the Russian drifting vessel North Pole had been discussed. Ling Tiejun, Deputy Director of the China Arctic and Antarctic Administration stated a system needed to be created wherein Russian and Chinese scientists could visit scientific stations in their countries. The first consultation meetings between scientific organizations regarding joint Arctic projects are scheduled to begin this autumn. According to Lanteigne, the Chinese government can attempt to grow closer with Russia in the Arctic, without entirely sidelining other Arctic states. ("Svalbard – research becomes more important for China, professor says," *Arctic Today*, 10 September 2024)

Polar Dialogue witnesses crafting of strategies for increasing Arctic collaboration

On 01 September, an article in *The Indian Express* informed about the inaugural Polar Dialogue held in Bengaluru, to deliberate about strategies to improve India's influence in the Arctic region. The Ministry of External Affairs (MEA) of the Government of India organized the two-day conference in partnership with the National Institute of Advanced Studies (NIAS) as an annual track 1.5 initiative, bringing together officials, scholars, public policy experts, and diplomats for discussions on the Arctic and Antarctic regions. The environmental, scientific, and geopolitical challenges and opportunities present in these regions were discussed. Ambassador PS Raghavan, Chairman of the National Security Advisory Board stated during his keynote address that China's growing influence in the Arctic region means that India must protect its own economic interests, and go beyond merely scientific exploration and research

in the Arctic. Raghavan also stated that tensions between the Western countries and Russia had led to the Arctic Council being polarized, leading to China seeking greater influence through participation in infrastructure, energy, and connectivity. The chairman informed that India could not be a silent bystander to the geopolitical tussle in the Arctic region, and needed to protect its interests. Raghavan also emphasized that India needed to 'think long ahead' when nurturing ambitions on the global stage. The implications of escalating climate change in the Arctic and its impact upon India such as on the monsoon and causing agrarian distress was brought out by Dr. M Ravichandran, Secretary at the Ministry of Earth Sciences. Ravichandran gave the example of how the reduction of Arctic sea ice has resulted in rainfall in India covering a 100 square kilometres and spread across a month now occurring in just 1 square kilometre of an area in the span of a few days. (Sanath Prasad, " 'India can't be silent bystander in Arctic region, should go beyond scientific research;' Polar Dialogue," *The Indian Express*, 1 September 2024)

India Arctic engagement focus at Polar Dialogue

On 31 August, an article in *Deccan Herald* informed about the discussions at the inaugural Polar Dialogue. The Dialogue organized by the Ministry of External Affairs in partnership with the National Institute of Advanced Studies involved discussions are the politics and science of polar regions. PS Raghavan, Chairperson of the National Security Advisory Board stated that India needs to engage even more with the Arctic states, at a time when a geopolitical tussle is emerging. According to Raghavan, China has attempted to use the situation of polarisation in the Arctic states by seeking greater influence in domains like infrastructure. Raghavan stated that India could not be an innocent bystander at a time of territorial disputes and militarization increasing in the Arctic region, and informed that the Government of India has increased its Arctic engagements. India published its official Arctic Policy in 2022, marking a new point in its engagement beyond scientific research interests. ("India's Arctic engagement in focus at Polar Dialogue," *Deccan Herald*, 31 August 2024)

SCIENCE & TECHNOLOGY

Japanese research vessel Mirai observes Arctic Sea ice

On 16 September, the Japanese oceanographic research vessel, Mirai recently passed the ice edge of the Arctic Ocean, making its first observations for this cruise in waters under ice cover. Duke Snider spotted the area where open water breaks from the sea ice with many floes floating on the horizon. The vessel took observations at 76 degrees North, and 167 degrees West, with drones and sensors at minus 2.6 degrees Celsius. Snider pointed out the warming in the Arctic, as much thick multiyear ice has disappeared over the past ten years. The lead researcher from JAMSTEC Motoyo Ito said: "In the 1990s, it was difficult to come this far north unless with an icebreaker." She emphasised the large expanding ice-free areas during summer. Through this journey, the Mirai reveals the harsh reality of climate change that exists in the Arctic. As the vessel moved further into heavier ice formations, phenomena such as iceblink were observed, which explains and further brings out the peculiarities of this ever-changing environment. (Jiji, "Japan's arctic research vessel Mirai reaches sea ice area," *The Japan Times*, 17 September 2024)

PREFIRE satellites of NASA to monitor polar heat emissions

On 10 September, an article in *earth. com* informed about the new NASA mission, the satellite called Polar Radiant Energy in the Far-Infrared Experiment or PREFIRE. This mission aims to deepen the understanding of how polar regions radiate heat into space. The satellite provides data which will improve the ability to predict the impact of climate change on the ice, ocean, and

weather patterns of the Earth, through studying the far-infrared radiation emitted by the Arctic and Antarctic. Understanding the process of atmospheric elements like clouds and water vapor trapping the heat will also help understand the greenhouse effect; wherein gases like carbon dioxide amplify global warming. The mission was launched with two CubeSats in late May and early June and has already begun transmitting insights to comprehend the heat exchange dynamics. PREFIRE is also an example of collaboration, with NASA and the University of Wisconsin-Madison jointly developing the mission. Additionally, the CubeSats were built and operated by Blue Canyon Technologies. Karen St. Germain, Director of the Earth Science Division at NASA stated CubeSats like PREFIRE would help observe the planet and bridge knowledge gaps. The two CubeSats can collect data that can analyse the impact of phenomena like cloud formation upon far-infrared emissions. Beyond polar heat emissions, the data collected by PREFIRE could be used to refine climate models and contribute towards more accurate temperatures, in an ever-changing climate. PREFIRE is also a prospective model for efficient and targeted missions, without large satellites being used. (Eric Ralls, "NASA's PREFIRE satellites monitor polar heat emissions from space," *earth.com*, 10 September 2024)

Arctic oscillation and polar vortex to give real-time insights on temperature patters in North America and Europe

On 26 August 2024, an article in *Verisk* informed on an experimental process of regular research, review, and analysis of the Arctic Oscillation (AO) and Polar Vortex (PV). The process was conducted by Judah Cohen from Atmospheric and Environmental Research. This analysis aims to provide researchers and practitioners with real-time insights into one of the leading drivers for extreme and persistent temperature patterns in North America and Europe. The AO is currently positive and is predicted to trend mostly negative over the next two weeks. This is owing to pressure and geopotential height anomalies across the Arctic which are predicted to become increasingly positive next week. The North Arctic Oscillation is currently positive with negative pressure and geopolitical height anomalies across Greenland. It is predicted to persist negative over the next two weeks. General troughing and negative geopotential height anomalies across Europe will support rising and positive geopotential height anomalies across most of Europe. Positive geopotential height anomalies centred over Eastern Europe is predicted for Asia. This will force troughing and negative geopotential height anomalies first across Central Asia, and then expanding into Western Siberia. Troughing and negative geopotential height anomalies are predicted across western North America, forcing ridging and positive geopotential height anomalies in eastern North America. Across Europe and Asia, there is a relative warmth that exists at present. Kazakhstan, Eastern Siberia, and Northwestern Europe have cooler temperatures, in contrast. There are temperature variations present within North America as well; including relatively cool temperatures in western Canada and the western and eastern parts of the US. On the other hand, temperatures in the central part of the US and central and eastern Canada were relatively warm. The biggest temperature changes have been witnessed in the western US where temperatures are now below normal. ("Arctic Oscillation and Polar Vortex Analysis and Forecasts," *Verisk*, 26 August 2024)

ICESat-2 satellite resumes collecting data on land ice and sea ice elevation changes

On 05 September, an article in *National Snow and Ice Data Centre* informed that the satellite ICESat-2 had resumed collecting data, after having its operations hampered during a solar storm. The solar storm involved a combination of powerful solar flames and coronal mass ejections (CMEs);

with the magnetosphere of the planet Earth being impacted. This caused the strongest geomagnetic storm since October 2003; which also adversely impacted the Ice, Cloud and land Elevation Satellite-2 or ICESat-2 of the National Aeronautics and Space Administration (NASA). ICESat-2 measures heights like land, vegetation, water, and human-built structures in urban areas across the Earth's surface as well as elevations of land ice and sea ice; using the Advanced Topographic Laser Altimeter System (ATLAS) instrument. ICESat-2 provides a reading of how land ice and sea ice elevations change over time; however its orbit was affected by the geomagnetic storm. The geostrategic storm resulted in changes in the atmospheric density and gravitational pull which pushed ICESat-2 towards the Earth's atmosphere. While the satellite did not fall into the Earth, it went into a safe hold mode and stopped collecting data. However, after an analysis in safe mode; NASA scientists and engineers confirmed that the satellite had not suffered any lasting damage. This allowed it to be drifted back into the normal orbit elevation by early June; and ATLAS resumed collecting data in mid-June 2024. However, the recovery from the solar storm means there remains a small gap in the data archive. (Michon Scott, "Rolling with a solar storm: How ICESat-2 got back on track," *National Snow and Ice Data Centre*, 05 September 2024)

Polar Semiconductor secures USD 120 Million US grant for Minnesota plant expansion

On 13 May, *Telecom.com* reported that polar semiconductor, a manufacturer will receive USD 120 million in government funding to double the plant's production of sensor and power chips in Minnesota. The grant is from the Biden administration's USD 52.7 billion semiconductor subsidy program. The expansion coincides with the majority ownership of Polar falling into US hands through the planned purchase of a 59 per cent stake by private equity firms Niobrara Capital and Prysm Capital. Under Secretary of Commerce, Laurie Locascio framed Polar's technology as "critical" to a host of high-voltage applications. Minnesota is matching that with USD 75 million. The grant is the latest in a string distributed to sector heavyweights Samsung, Intel, TSMC, and Micron Technology, among others, by the US government in order to shore up the nation's chip-making prospects. According to the Commerce Department, power and sensor chip shortages during the pandemic caused disruptions in many industries, and showed the need to expand production in the United States. (David Shepardson, "Polar Semiconductor set to gain US government grant of $120 million," *Telecom.com*, 13 May 2024)

Low light productivity might be fuelling the Arctic Ocean ecosystem during spring and fall says an opinion in *Nature*

On 04 September, an article in *Nature Communications* reported on the photosynthetic growth and algal biomass buildup had resumed under the ice pack in the Arctic. The minimum light requirement for photosynthetic growth and the maximum depth for the euphotic zone is not well constrained. However, the article presented complementary field measurements of under-ice irradiances and phototrophic biomass from the high Arctic, proving that oceanic Net Primary Production (NPP) is possible at extremely low light levels. While the euphotic zone lower limit has normally been defined as the depth at which light levels are one per cent of their surface level, this overestimates the minimum NPP light requirement. NPP has been observed at levels 30-500 times higher than the theoretical minimum threshold in the ocean, as well as for ice algae. Knowledge of the lower light limit at which NPP can occur is essential for realistically estimating the temporal and spatial distribution of primary production and concurrent ecosystem dynamics. The article authors analysed the field measurements from the Multidisciplinary drifting Observatory for the Study of the Arctic Climate (MOSAiC) from their year-round survey on the resumption of photosynthetic activity after the polar night. The researchers measured

the NPP of ambient phytoplankton assemblages through volume-specific carbon fixation rates. Surface water samples were exposed to a reference temperature of one degree celsius. The rates of exponential increase in NPP occurring in the mixed layer did not relate to physiological acclimations. Laboratory studies and field observations arrived at the same conclusions, of cells retaining their photosynthetic machinery active overnight so that it can be instantly used when light returns. While these measurements represent only the potential capacity of existing biomass to fix carbon, the NPP increase shows an actual increase in photosynthetic biomass despite low light levels. Optical sensors were utilized to find the light levels under which photosynthesis took place. These findings imply that low light productivity might be fuelling the Arctic Ocean ecosystem during spring and fall. The idea that summer microalgal growth in the Arctic Ocean is light-limited is also challenged, and grazing pressures and nutrient limitations might control biomass buildup more. Arctic Ocean data also shows that net photosynthetic biomass buildup close to the theoretical minimum light requirement is physiologically possible. The fundamental capacity of photosynthesis to be this efficient also applies to other low light environments, in all likelihood. The results also indicate that the euphotic zone depth might be lower than expected, and phytoplankton communities in the oceans might be more productive even during low light seasons. (Clara JM Hoppe, Niels Fuchs, Dirk Notz, Philip Anderson, Philipp Assmy, Jorgen Berge, Gunnar Bratbak, Gael Guillou, Alexandra Kraberg, Aud Larsen, Benoit Lebreton, Eva Leu, Magnus Lucassen, Oliver Muller, Laurent Oziel, Bjorn Rost, Bernhard Schartmuller, Anders Torstensson and Jonas Wloka, "Photosynthetic light requirement near the theoretical minimum detected in Arctic microalgae," *Nature Communications*, 04 September 2024)

Visasat confirms launch of Arctic Satellite Broadband

On 02 September, an article in *Communications Today* informed that communications company Viasat Inc. had confirmed the launch of the Arctic Satellite Broadband Mission (ASBM). Heosat, a subsidiary of Space Norway is leading the mission which will see two satellites deployed in a highly elliptical orbit (HEO). Viasat will use the two satellites ASBM-1 and ASBM-2 tO extend its high-speed network with dedicated Arctic region coverage; with the satellites hosting GX10A and GX10B Ka-band payloads. The payloads are expected to enter service in early to mid-2025, in what is the world's first HEO mission carrying a broadband commercial service payload. Visasat has five new Ka-band satellites under construction; showcasing its expansion of high-speed broadband capacity and capabilities for both government and commercial mobility customers. The Arctic is also growing in connectivity demand as its usage by commercial mobility customers, scientists and governments go. Kjell-Ove Skare, Program Director at Space Norway stated that the ASBM satellite launch was one step closer towards providing broadband for Arctic users. ("Arctic Broadband on the way as Viasat confirms successful launch," Communications Today, 02 September 2024)

NASA's IceNode robots reveal Antarctic ice shelf secrets, reports *The Engineer*

On 02 September, *The Engineer* reported that NASA's Jet Propulsion Laboratory is leading an effort called IceNode that will send robots into the dark depths of Antarctic ice shelves. The 2.4-metre-long, 25-centimetre-diametre robots will study the critical "grounding zone," where ice, ocean, and land meet. This zone, which no satellite can see, is of particular interest in determining how fast ice shelves are melting and, by extension, how fast sea levels may rise. The project's science lead, Ian Fenty, emphasises how crucial it is to catch the data directly at the interface of ice-ocean melting. The robots, fitted with advanced software for autonomous positioning, will be deployed through

boreholes or from ships. They will attach themselves to the ice using spring-loaded landing gear and collect data on water circulation and melting patterns for as long as a year. According to Paul Glick, the principal investigator leading IceNode, the robots are a platform for taking scientific instruments into some of the most inhospitable places on Earth. After tests in Monterey Bay, Lake Superior, and the Beaufort Sea off Alaska, the team is hoping to deploy a full fleet beneath Antarctic ice shelves. ("NASA's IceNode robots measure polar ice shelf melt from below," *The Engineer*, 02 September 2024)

Underwater robots being developed for Antarctic ice exploration

On 01 September, an article in *EarthSky* informed about underwater robots being developed by the National Aeronautics and Space Administration (NASA)'s Jet Propulsion Laboratory. The robots are part of the project known as IceNode which envisages a fleet of autonomous robots venturing beneath the Antarctic ice to help scientists calculate how fast the continent is losing its ice. The project will also determine how fast melting can cause global ice to melt. It is estimated that if the Antarctic ice sheet completely melts, global sea levels will rise by 60 metres. This makes it crucial for scientists to accurately estimate ice melt rates, especially in the underwater area known as the "grounding zone" where floating ice shelves, ocean and land meet, as well as unmapped cavities. IceNode engineers aim to resolve this problem by developing robots which have three-legged "landing gear" to attach themselves to the underside of the ice. The robots will position themselves autonomously through novel software which uses information from ocean current models, and then ride these currents on the journey beyond an ice shelf. The IceNode fleet will operate for a year, capturing data including measurements of how fast warm, salty ocean water is circulating up and how fast colder, fresher meltwater is sinking. While additional development and testing remains, IceNode's deployments so far have been promising. Researchers stated they were satisfied with the progress after a test through the U.S. Navy Arctic Submarine Laboratory's Ice Camp. ("Underwater robots to explore beneath Antarctic ice," *EarthSky*, 01 September 2024)

SHIPPING

Russia dispatches 10.7 million barrels of crude oil via Northern Sea Route

On 26 September, an article in *gcaptain* informed the Government of the Russian Federation had dispatched record amounts of oil through its section of the Arctic Circle this year. At least 15 oil tankers with about 10.7 million barrels of crude oil have used the Northern Sea Route, already more than the total for 2023. Five tankers are still scheduled to make the passage through the Northern Sea Route, which could push the total to over 14.4 million barrels. The Northern Sea Route has become an attractive shipping route between Russia and China, owing to Western sanctions on Russia and Houthi attacks in the Red Sea. The route also halves the time required to move cargoes from Baltic Sea ports to China, taking about three weeks compared to 50 days via other routes like from the port of Murmansk. The Russian government-owned nuclear corporation Rosatom stated the early onset of ice formation due to large levels of residual ice present had shortened the navigation season for the Northern Sea Route. (Julian Lee, "Russia Ramps Up Arctic Oil Shipping to a New Record," *gcaptain*, 26 September 2024)

Northern Sea route of Russia witnesses high levels of transit voyages

On 17 September, an article in High North News informed of the Northern Sea shipping lane of Russia witnessing high traffic. A news report by the Centre for High North Logistics(CHNL) of Norway informed that 30 transit voyages carrying around 1.3

million tons of cargo had passed through the Northern Sea route in the first two months of the 2024 summer and fall navigation season. Another key factor noted was the dominance of shipping connections between Russia and China in Arctic development and shipping; with 98 per cent of cargo flowing between ports of the two countries. Crude oil and bulk items like iron ore and coal dominate the cargo flow from Russia to China. Transit shipping also remains highly concentrated on Russian ports, with all vessels in the 2024 shipping season having originated or arrived in a Russian port. The CHNL estimated that 2024 transit traffic would surpass the record set last year of 2.1 million tons. Nine oil tankers have travelled from Russia to China this year with around 900,000 tons of crude oil. Five bulk carriers delivered about 416,000 tons, with a mix of coal, iron ore, and mineral fertilizers. Most vessels originated from the Baltic Sea and Murmansk. However, there has been little traffic in the opposite direction, with the exception of container shipping. Four Chinese or Hong Kong-based box ships carried around 17,000 tons of containerized cargo from China to the Russian port of Arkhangelsk, with two of the ships making the return voyage loaded with 11,000 tons. Cargo traffic in transit voyages could increase in the coming months, with Russia's emerging LNG shadow fleet. (Malte Humpert, "New Report: Busy Summer for Arctic Shipping on Russia's Northern Sea Route," *High North News*, 17 September 2024)

Russia's shadowy LNG shipments navigate Arctic waters, reports *Arctic Today*

On 09 September, *Arctic Today* reported that the 277-metre Everest Energy, ice-class +1A1, is part of Russia's secret fleet that ships LNG from the Arctic LNG-2 project sanctioned by the United States aboard. Recently, it loaded cargo at the Utrenny terminal in the Gulf of Ob and headed off for Asian markets via the Northern Sea Route. Of particular interest is that this and other ships in Russia's "shadow fleet" do not appear in the official registries of the Northern Sea Route Administration. This thereby underlines the secret character of these operations. Everest Energy, owned by Mumbai-based Ocean Speedstar Solutions Opc Private Limited, is Russia's attempt to circumvent the United States sanctions on its energy sector. Vessels sold multiple times, the originally Norwegian-owned vessel is the latest of many. The challenge is sea ice, between it and the passage across the Arctic through the North Siberian and Chukchi Seas. It is the latest operation underlining Russia's commitment to sustaining hydrocarbon exports, despite such restrictions by the international community, which have garnered support from partners such as India. The use of such "invisible" tankers thus reflects Moscow's high-level backing for such unconventional shipping strategies. ("A former Norwegian tanker now smuggles Russian LNG across the Arctic," *Arctic Today*, 09 September 2024)

Russia sends conventional LNG carrier on Northern Sea route for first time ever

On 08 September, an article in *gCaptain* informed Russian oil company and Liquified Natural Gas(LNG) producer Novatek had sent the non-ice class LNG carrier Everest Energy onto the Northern Sea Route. This is the first time that a conventional carrier has attempted to cross the Northern Sea Route, a further escalation of the risk profile of Arctic shipping. Everest Energy does not hold a permit under the Northern Sea Route Administration, the Arctic permitting authority of Russia. The carrier going on a direct route via the Northern Sea Route indicates that the Government of the Russian Federation is aiming to market its sanctioned LNG in Asia. The carrier is travelling under a suspended Palauan flag and forms a part of Russia's emerging LNG shadow fleet. Everest Energy departed late on 06 September for the Arctic LNG 2 project and has entered the Kara Sea travelling east towards Asia. Previously, sanctions imposed by the United States have prevented attempts by Russia to

deliver sanctioned cargo from Arctic LNG 2 to customers through traditional shipping routes. Nine LNG carriers associated with the project have been targeted by US sanctions, and the Government of Palau has temporarily suspended the flags of five carriers owing to an investigation into illegal shipping practices. The lack of registration means that vessels are likely to face challenges to cross regulated international straits. (Malte Humpert, "In Desperate Move Russia Sends First-Ever Conventional LNG Carrier Through Arctic," *gCaptain*, 08 September 2024)

Chinese Icebreaker mission to the Arctic signals Beijing's polar ambitions

On 03 September, *USNI News* reported that China's deployment of a three-icebreaker in Arctic waters marks Beijing's growing ambitions in polar regions. CSIS researcher Aidan Powers-Riggs stated that China conceives itself as a "near-Arctic power" and is laying the foundation for its commercial and scientific presence in the region. This occurs when the US is faced with challenges due to USCGC Healy's research mission being cut short due to an electrical fire. Chinese interests in the Arctic include mineral exploration, energy development, and new shipping routes. The Northern Sea Route has become attractive for Chinese oil shipments, with much shorter transit times compared to traditional routes. The growing collaboration on Arctic affairs between China and Russia also covers shipping and polar technology through high-ranking meetings in recent months. While China contributes to scientific research in the region, Powers-Riggs cautions that some of this research involves potential dual-use applications, including synthetic aperture radar and oceanographic surveys, which may be applied militarily. The US is working to upgrade its fleet of icebreakers and the construction on a new Polar Security Cutter is scheduled to begin in 2024. (John Grady, "Chinese Icebreaker Mission to Arctic 'Clear Signal' of Beijing's Polar Ambitions, Says Expert," *USNI News*, 03 September 2024)

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